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The Farmer's Digest

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The Farmer's Digest

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The Farmer's Digest

Volume 5 July, 1941 Number 3

Pre-Milking of Heavy Producers

Condensed from Holstein-Friesian World

H. P. Davis and G. W. Trimberger

University of Nebraska

FEW references are available concerning the milking of cows before calving. While the swelling of the udder in the case of a heavy milk producing cow would often seem to indicate that milking was advisable to relieve the pressure, most authorities have been against the practice. One author in opposing the practice, states that milking a cow previous to calving tends to delay the onset of parturition because of the close relationship between the nerves of the udder and of the reproductive organs. A further explanation is given that previous milking may cause the muscular contraction of the uterus at parturition to be weaker with the possible result of difficulty in the delivery of the calf.

At the University of Nebraska, it was decided to determine if milking cows previous to calving would have a beneficial effect on the cow. Therefore, for a period of two and one-half years, the great majority of cows were started milking twice daily at a time that was estimated would be seven days prior to calving. As a result some cows were milked longer than seven days, while others were milked a shorter time. In Table I is presented the average production for cows of the several breeds for each of the seven days prior to calving.

It should be mentioned that in the Herd Improvement Registry, the Holstein herd has been averaging about 550 lbs. of fat, while the Ayrshire, Jersey, and Guernsey herds have averaged in excess of 400 lbs. of fat in the herd tests of their respective breeds. As might be expected, the production prior to calving has a definite relationship to the producing level of the cow. The highest producing cows for each breed in the majority of cases produced the largest amount of milk before calving.

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Milk Produced by Cows Before Calving — Dairy Average

Breed	Cows	No. of Days Before Calving					
		7	6	5	4	3	2	1
	No.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Holstein	68	2.94	4.43	5.62	7.04	10.48	13.86	22.11
Ayrshire	32	.53	.99	2.21	3.67	4.76	6.37	11.02
Jersey	30	.45	.58	.98	1.45	2.70	4.95	10.14
Guernsey	26	.73	.98	1.52	1.79	2.83	5.61	10.88

The Holstein cows had an average production on the 7th day before parturition of nearly three pounds of milk daily and this increased day by day until on the day before calving the production had reached 22 lbs. The other three breeds produced on the average of about one-half a pound on the 7th day preceding calving and increased to an average over 10 pounds for the day prior to parturition. It was possible to predict, with a certain degree of accuracy, the day on which the cows would drop their calves, based on the increase in milk production during the day or two preceding parturition.

It was found that the swelling, inflammation, and physical strain to which the udder is subjected can be greatly reduced by milking the cow before parturition. Although the quantity of milk actually obtained by milking before freshening was not as large as was expected, the procedure does give much relief to the udder. Apparently there was less shock at parturition and so far not a single case of milk fever has followed the precalving milking procedure. No delayed parturition was experienced, and as far as could be observed, the uterine contractions were normal.

The milking of cows before calving raises a question of considerable importance in calf-raising, since a calf dropped after its mother had been milked for several days very likely does not receive in the first milk which it gets, the same properties that would be in normal colostrum. Calves that were born to cows in the above experiment were particularly susceptible to intestinal infections which often proved fatal. These infections were apparently in most cases due to organisms of the B. coli group. It seemed that the calves were so lacking in resistance that these common intestinal organisms, which ordinarily are harmless, invaded the entire body and multiplied very rapidly in the various organs. Some of the calves developed diarrhea and failed gradually over a period of several days, while others appeared normal and died within a few hours from a generalized infection which caused a quickly fatal

septicemia. Calves of the few cows that were not milked before parturition did not exhibit difficulty from intestinal infections. It should be mentioned that the calves that developed the digestive difficulties were allowed to nurse their dams for a period of three days after birth. From the results in these calves, it seemed that there was something in the colostrum that had protective properties for calves that at least partially had disappeared from the milk of cows that were milked previous to calving. It was decided to save and store the colostrum from some cows that had not been milked before parturition by placing it in clean covered gallon pails and freezing into solid cakes of ice and storing at a low temperature. When it was needed for feeding, the pail of frozen colostrum was placed in a vessel of hot water and gradually thawed, and then heated to a temperature between 90 and 100°F and fed from a pail to the new-born calf in quantities varying from four to six pounds at a feed. Care had to be exercised in thawing colostrum as the direct application of heat to the pail caused coagulation. This procedure eliminated the digestive difficulties and was apparently equal to fresh colostrum. In fact, colostrum stored as long as five months gave good results. In saving colostrum, that produced from the first milking after calving was most effective. If colostrum is saved for a series of milkings, the parts should be so labeled that it will be fed to the calf in the same order that it was taken.

To determine, by experiment, whether the milk taken from cows before parturition has the properties of colostrum, efforts were made to save the various fractions of milk, and these were frozen as they were produced from the cows milked before calving. Even small quantities of milk obtained under these conditions were saved. It was found that if a cow is milked before parturition, the first milk obtained is not entirely comparable to colostrum. Several precalving milkings were saved, and when this milk was fed in place of colostrum, the order of feeding always followed the order of collection. This milk produced fairly good results but was inferior to frozen colostrum from cows calving without having been milked prior to freshening.

In feeding frozen colostrum, two methods were followed in the case of calves whose dams were milked previous to calving. One group was allowed to remain with their dams for the normal period of three days, after which frozen colostrum (thawed and warmed) was fed as normal milk. The second group was allowed to nurse once and then fed frozen colostrum for three days. The

second group had fewer digestive disturbances than the first group and was equal to the normal calves of the herd. It is possible that these results came about because of greater ability of calves to absorb antibodies during the first day or two of life.

The saving of colostrum from normal cows and freezing it can be used as a means of feeding calves from cows that suffer from mastitis. Calves from such affected cows frequently develop digestive disturbances so that it is advisable not to allow them to nurse their dams and feed them the colostrum that has been taken from disease-free cows and stored until needed. While we have had no experience, Ragsdale and Broady reported the successful pasteurization of colostrum from diseased cows by heating to 140°F for 30 minutes in a water bath.

These results emphasize the importance that colostrum plays as an immunizing agent in the new-born calf and show its importance in the early physiological development of dairy calves. A knowledge of this combined with the storing of colostrum by freezing may help avoid trouble and prevent the loss of valuable calves.

Breeder Experiences with Pre-Milking

About the same time the foregoing report of the Nebraska experiment in pre-milking of heavy producing cows appeared, we noted in the Farmer's Magazine, well known Canadian publication, an article by R. L. Ruddy, of Hermitage Farm, Ayrshire breeder at Pickering, Ont., in which this same question was discussed. We append it as a further contribution here on a subject that will be of general interest to herd owners.

Says Mr. Ruddy: "Our system of Mastitis control starts with first calf heifers and we have taken the advice of C. L. Clevenger, Superintendent of the great Mount Hope Farm in Williamstown, Mass.

Mount Hope have for some years practised "pre-milking"; that is to say, they have started to milk all their cows and heifers for from 3 weeks to 3 days before calving, depending on the individual. This procedure was primarily brought into force to avoid udder and feeding troubles.

Mount Hope's first lead on pre-milking came from Prof. Boutflour of the Royal Agricultural College, Cirencester, Eng. Prof. Boutflour has become world renowned as the man who worked out the ration for "Cherry," the grade milking Shorthorn which recently produced a world record over all breeds of 41,000 lbs. of milk. Let me quote from Mr. Clevenger's account of the Professor's visit to Mount Hope.

"Shortly after his arrival and while looking over our herd, we

came to a stall where one of the men was attempting to milk a heifer with her first calf. As you know from personal experience, he had his hands full, with the badly caked udder and swollen teats. Prof. Boutflour remarked that the training should have been taken care of three weeks before and the swelling prevented entirely. Of course we were greatly interested in his statement and immediately asked questions. He told us how they had learned to avoid the udder and feeding problems associated with calving time by milking the cows and heifers before freshening."

I have been in close touch with Mount Hope by letter and their experiences have been most reassuring. They have not had any unfavorable results and have, with their mature animals, prevented the breaking down of the udder and have done away with the pendulous appearance common to older cows.

Pre-milking was later discovered to eliminate milk fever probably brought about by the gradual increase in production as contrasted to the great increase, with the resulting shock to the entire system of the animal that occurs just after calving by the terrific drain of colostrum and calcium to the udder.

We have now instituted pre-milking into our herd with all first or second calf heifers that show any signs of swelling or caking. The resultant elimination of the caking is most important in combating mastitis and other attendant dangers resulting from inflammation in the udder. Also the heifers are much more easily trained and are ready to go right to work and start off at a much higher rate of production than previously.

We have raised equally good calves through pre-milking and have had a lot less trouble with scours. The actual act of parturition evidently brings with it sufficient colostrum properties to insure the health of the calf.

One important point must be added, however. Once a cow is started on pre-milking she must be milked dry night and morning, through her calving and into her lactation. If pre-milking is once begun and then discontinued before calving, there is real danger of milk fever. Mount Hope ship the milk from their pre-milkers and have had many animals give from 30 to 40 lbs. a day previous to calving.

The Watercress King

Condensed from The Southern Planter

Mollie Merrick

HALF a million bunches of watercress produced each year at the Martinsburg, West Virginia, plant of C. E. Dennis is an interesting footnote to a story, the beginnings of which go back fifty years. For farming history was made by the late Mr. Dennis, father of the present watercress king, when he converted what had been considered necessarily a wild crop into a scientifically produced market reliable. Discarding the theory that this succulent salad plant was a gypsy among its kind that could thrive only when and how it chose, Mr. Dennis combed the countryside for seed, planted it in beds which reproduced scientifically the identical conditions found in its wild growth, and established one of the country's most profitable one-product farming ventures.

At Martinsburg C. E. Dennis found ideal conditions of spring water, mineral content of soil and climate calculated to stimulate the plant's growth. Here he made his headquarters and in order to insure crop rotations — for he supplies watercress all the year round to most states of the Union —he created subsidiary plants in Pennsylvania, Maryland, Virginia and Alabama.

Visitors to the Martinsburg plant learn how Nature has been craftily supplemented in the production of a green which daily is in greater demand. Since watercress grows best in spring water, and fastest in water that has motion, the Martinsburg beds are fed from a spring 52 inches at its source. Over ten million gallons of water are run through the shallow ponds daily, the motion stimulating the growth of the plants which provide a crop every six weeks.

At planting time the beds are drained and the soil enriched with lime and fertilizers, since watercress must be grown in limey, clayey soil in order to have high calcium and mineral content, as well as color, size and perfect flavor. When plants are mature, they are cut in much the same manner as flowers. Pickers wearing rubber boots wade out into the ponds and cut the top plant and a portion of the stem, leaving the lower stems and roots to send out new shoots.

Although the water of the

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ponds is rigorously tested by the County Board of Health, whose standards are the highest, each spray of the watercress is put through a chlorine solution bath to insure absolute cleanliness. This precaution, entirely a voluntary one with these growers, is typical of the high efficiency back of the production of $100,000 worth of watercress marketed each year at a retail price of about ten cents per bunch.

Speed in shipping and in handling the cut product, more than any other factor, determines the value of watercress after it reaches the markets. In order to insure firm unbruised leaves, the watercress is packed at Martinsburg in specially constructed boxes made on the premises. A layer of chopped ice is topped by a layer of brown paper; the cress is fitted in on top of the paper, and the process is resumed until the box is filled. Insurance against possible delays has been considered from every angle. Fifteen tons of paper are required each year for shipping the product, and three to five hundred pounds of tape which bears the grower's name is assurance to the housekeeper that she is getting some of the finest the market affords. Watercress shipped in this manner from the Martinsburg farm in the morning, reaches the Washington markets that same night.

Several varieties of watercress now supplement the one with which the industry started. These types have different bearing seasons and are staggered in the growing beds so that a year-round supply is insured. Aldrich, a fine round leaf, is popular now, although it only came into general use about two years ago. The Swan Pond type, named from the locality in Pennsylvania in which it was first found, has a dark rich leaf and is found on the markets in early spring and fall. Most delicate of all is Virginia, the summer cress, which is seedless and does not survive many cuttings.

Mr. Dennis, who is an authority on this subject, warns shoppers to snap a leaf of cress when buying to see that it is crisp and fresh. Watercress that is fading or that has stood sufficiently long to have lost its crispness, has lost much of its flavor and vitamin content as well.

The Dennis farms, scientifically planned in five Southern states whose gradually changing weather conditions permit a year-round supply of watercress, represent one of the most interesting farming ventures of which we know.

Hay Dryer

Condensed from Capper's Farmer

Amos Sloan

FARM hay drying has been made practical by equipment developed at the Tennessee Experiment Station. Rauth Brothers have installed the system on their farm in Warrick county, Indiana. It consists of a motor and fan set up on the outside with a series of ducts for distributing forced air thru the hay.

The main duct, 42 inches square, enters the barn midway of the side and extends to the center of the hay mow where it divides into 2 smaller ducts, one in each direction the long way of the barn. Every 4 feet along these branches, and at right angles to them, is a smaller duct, or upside-down trough, 6 by 12 inches. These lateral ducts are for distributing air and so are open on the bottom side which barely clears the mow floor. The whole distributing system is made of lumber, altho any other material, sufficiently rigid and inexpensive, presumably would be adaptable. Plans for the system were obtained from the Tennessee Station.

Hay is spread over the entire mow area in a layer up to a maximum depth of 6 feet, the first and second fillings.

The 4-foot fan, out of a coal mine ventilating system, and a 5-horse motor are housed in a simple lean-to-type shed set on pillars to afford ample air intake below the walls. Specifications were drawn to deliver 8⅓ cubic feet of air a minute for every square foot of floor space. The assembly will deliver 20,000 cubic feet of air space a minute with the fan operating at 200 revolutions. If quick drying is required after a few days of muggy weather, a tractor is belted to the fan and the speed stepped up to 400 revolutions and the air delivery is increased to 35,000 cubic feet a minute.

"With this plant we are able to cut hay in the morning and put it up that afternoon, unless it is wet," said Mr. Rauth. "That means there is less chance of spoilage, we get a better quality of hay because there is no loss of leaves and fine stems, no bleaching and we preserve all the vitamins that the alfalfa contains at cutting time. That, in turn, means we have a better-quality product from the cows, one which is rich in the vitamins which milk produced from green feed contains. The hay cured in this way

approaches pasture conditions as nearly as it is possible with a dry feed. So, in addition to a better product, we get a higher yield."

After the first 2 cuttings, the layer added each time is reduced in depth because drying is slower with the necessity for air to pass thru a greater volume of hay. But the thinner layers normally coincide with the size of later cuttings and so no delay is experienced in getting the hay under cover.

Ideal conditions after a filling are hot days and low humidity. This insures quick drying and the motordriven fan will accomplish curing without delay. But should damp rainy weather ensue after a filling, the motor and fan are kept going to cool the hay and prevent fermentation. Then the first dry day, a tractor is belted to the fan and the aerating is stepped up.

Although the system is quite satisfactory in its present form and fully justified, Mr. Rauth is considering an improvement by using artificial heat. A larger boiler will be installed in the bottling plant to supply winter heat also for his residence. "That same boiler we propose to employ in facilitating hay drying during summer if necessary," he said. "With steam coils in the system, it should be possible to heat the air and thus increase its moisture-absorbing capacity. Hereafter we expect to chop the hay."

Labor in handling hay in this way is estimated to be about the same as under orthodox methods. Although total weight is greater, turning, spreading and other efforts to hasten field curing are eliminated. Tennessee experiments indicate cost of drying is about 86 cents a ton. That, Mr. Rauth estimated, is about right for his conditions, and in view of the greater yield of leaves, the better quality, higher vitamin content, and milk-stimulating qualities, he considered the extra cost inconsequential. Under chopping he believed handling labor could be reduced somewhat and the effectiveness of a given tonnage increased. Further, the better-quality hay should enable him to reduce the protein concentrate allowance from other sources, particularly with the soybean silage he was providing.

The Soil Basis of Better Milk Production

Condensed from Certified Milk

L. N. Maynard, Ph.D.
Cornell University, Ithaca, N. Y.

IT is generally understood that the nature of the feed of the cow affects the quality of her milk as well as its quantity. It is less appreciated that the quality factors in the feed depend upon how the feed crop is produced and particularly upon the fertility of the soil.

Some twenty years ago McCollum coined the term "protective foods" to denote products (of which milk is an outstanding example) rich in certain nutrients frequently lacking in the human diet unless special attention was given to supplying them. In the same way it came to be realized that we needed to pay attention to having these same special nutrients in the rations of our animals, not only to improve their growth and production but also to provide animal products of the best nutritional quality for man.

The need for paying attention to nutritional quality in our feed supply has become increasingly important for two reasons. In the first place we have stepped up nutritional demands through breeding for higher production and by setting higher standards for growth, body development and satisfactory yield. At the same time, our feed supply has tended to become poorer in quality because of several developments, among which a very important one has been a depletion of our soils.

The unfavorable influence of soil depletion on crop yields is fully appreciated and increasing attention to restoring and maintaining the crop yields through fertilizer applications has resulted. The significant point here is that yield, as measured by tons per acre, has been the primary goal both in experimental work and in practice. A good yield is essential but it is not enough. We need to pay attention to nutritional quality, to yields of nutrients as well as yields of dry matter.

Clearly we must start with the soil in improving the nutritional quality of our feed supply, and thus provide the basis not only for larger yields of animal products but also products of superior nutritional quality for man.

In considering the soil basis of better nutrition, the mineral re-

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lations most obviously suggest themselves for consideration. There are many soils which will produce a luxurious growth of forage and yet a forage so deficient in one or more mineral nutrients as to seriously affect animal growth and production. You are all doubtless aware that there are areas in this country where alfalfa grows luxuriously yet is so low in phosphorus as to cause poor animal growth, breeding trouble and marked losses in production.

The recent studies in Tennessee serve to illustrate the soil, crop and production relationships which are here involved. The area known as the Central Basin has a highly fertile soil, rich in calcium and phosphorus, and has long been noted for the production of outstanding livestock. On the other hand, the soil of the Highland Rim surrounding the Basin area has only about one-sixth as much phosphorus and one-half as much calcium. Studies have shown that the hay grown in the Basin area contains over twice as much phosphorus, as well as more calcium and nitrogen, as that grown in the poor area. From animal studies it has been reported that steers receiving clover hay grown in the Basin made approximately 50 per cent better gains than steers fed the same hay from the Highland rim.

Still more striking data are afforded by the data for some of the trace elements. This is the situation as regards cobalt, an element which has not been demonstrated to be needed in plant nutrition. In fact, it is the last element added to the list of essentials in the diet of animals. Prior to 1900 it had been observed in Australia and New Zealand that on certain ranges the animals remained healthy, whereas on other ranges they became listless, anemic, lost appetite and weight and finally died. It was found that these troubles were limited to certain areas and that they could be prevented and cured by transferring the animals from sick to healthy areas. This was long practiced before anything definite was known about the cause. Investigations were actively pursued for thirty years before this cause was found. Around 1930, results suggested that these troubles were due to a lack of iron, but later it was found that chemically pure iron was without effect.

In 1935, it became definitely established that the potency of the original iron solutions which cured was due to cobalt, and since that time the disease has been found to respond to cobalt treatments either by giving it to the animal or by giving it to the soil. The amazing thing is that the calf in this state can be cured and kept healthy by a daily intake of cobalt so small that it

could be held on the head of a pin—a fraction of a milligram per day. It is also amazing that the same cure can be brought about by the addition of traces to the soil. The addition of only two pounds of hydrated cobalt chloride per acre to New Zealand pastures resulted in restoring grazing sheep to health. It has been established that where the pasture contains less than 7/100 p.p.m. of cobalt in the dry matter, sickness occurs in sheep. The addition of only eight ounces of cobalt chloride per acre has increased the content in the pasture grass ten times. Larger applications have been shown to increase the cobalt content of pasture grass as much as forty times. There are many areas in the world where this cobalt trouble exists. The only place in this country which has definitely been discovered thus far is in Florida.

More than a decade before the role of copper in hemoglobin formation was discovered investigators in Northern Europe were studying possible mineral deficiencies in areas where a wasting disease of cattle referred to as "lechsucht" was common. In 1933 it was established as a copper deficiency by finding marked differences in the copper content of the forage in "sick" and "healthy" areas and by curing the trouble by adding this mineral to either the ration or the soil. Very recently it has been found that a disease of suckling lambs, characterized by severe nervous symptoms resulting in death, is caused by a lack of copper in the diet of the ewe during gestation.

On the other hand there are certain trace elements, such as selenium, molybdenum and arsenic, occurring in the soils of certain areas in amounts which cause the forage to be toxic.

The large role which these mineral elements play in animal health and production is clear. Their significance in relation to milk quality must be clarified by further research. It is well understood that the calcium and phosphorus content of milk is not affected by the amounts in the feed. Less is known about the trace elements. The iron content of milk is not affected by diet, but on the other hand, the case is very different for iodine. We need further studies of many of the other trace elements, particularly those which in such minute amounts play vital roles, in both plant and animal nutrition. Experiments with small animals have revealed some differences in milk quality which remain to be explained. Some of the trace elements may here be concerned. Even though their concentration in the milk does not change, they may influence the metabolism of the gland in such a way as to change the nutritive value of milk in some other respect. Their remarkable, though only partially

understood, roles in animal physiology, make this a possibility. Nor should the apparent relationships between certain trace elements and vitamins be entirely left out of consideration. These ideas are frankly speculations, but from similar speculations have come some of our outstanding nutrition discoveries.

For certain vitamins there is a direct relation between the feed and the milk. With one exception all of the vitamins known to be required by animals and man are plant products and their concentration in crops depends on how they are grown, harvested and preserved. There is a soil relationship. True the plant manufactures the vitamins instead of taking them up from the soil, but soil and cultural factors markedly influence the concentration of vitamins in the growing plant. It has been repeatedly shown, for example, that green, actively growing plants are the ones which are richest in carotene. Moore, working in England, has recently shown that fertilizer treatments increase both the yield and carotene content of poor pasture. Similiar results have been reported for Vitamin C. Evidence is being obtained that there is a marked difference in the content of certain vitamins of the B complex for the same crop when grown on different soils. I have recently reviewed over 100 published experiments dealing with the vitamin content of food crops as influenced by soil and cultural factors. Some of these studies are contradictory, but as a whole the evidence makes it clear that soil factors can influence vitamin content though the specific factor concerned may be in doubt.

The Carob Tree Invites Attention

Condensed from Texas Farming and Citriculture

NOT many agriculturists here have ever heard of the Carob tree, yet considerable commercial planting has been started in Southern California, and at the Chico Experiment Station there the U. S. Department of Agriculture has a Carob grove in which studies of the tree have opened promising vistas as to its value, particularly in providing excellent forage for cattle.

The tree's history and performance in California have proved it to be well adapted to southern latitudes. Older trees will withstand temperatures as low as eighteen degrees Fahrenheit, though younger ones are less immune to cold weather. The tree produces a bean which is about a foot long and has, when mature, a sugar content of forty to forty-five percent and about eight percent protein. A representative tree's annual yield varies widely with its age, being between four and five hundred pounds in early maturity and becoming five or six times that amount in later years.

The forage value of carob beans is recognized by many California cattlemen. In the land of the tree's apparent origin, Arabia, the beans have been used for many centuries as feed for the celebrated Arabian breed of horses and for human consumption.

Carob trees attain considerable height, have a rather luxuriant foliage and, in addition to their bean crop value, are regarded highly for their shade in the hot regions of their origin. New trees are usually grown from buds on parent stock and begin to bear fruit in three or four years. If developed from seedlings, the time required for fruit production is about seven years.

St. John's Breadfruit

An article on Carob trees appeared in the December number of Nature Magazine, published in Washington, D. C., and what follows is mainly information supplied by the author, John Edwin Hogg. The Carob tree has been highly esteemed for many centuries by the peoples of the semi-arid lands bordering on the Mediterranean Sea. It has been called numerous names, the best known of which is St. John's breadfruit, John the Baptist being supposed to have subsisted on it during his sojourn in the wilderness. Carobs first came under the observation of the writer in Palestine in the summer of 1912. This was on a trip from Jerusalem into the Valley of the River Jordan. He was traveling

Reprinted by permission from Texas Farming and Citriculture, May, 1941

in an ancient automobile which blew a tire a few miles out of Jericho and while his guide was under a big umbrella to protect him against the torrid sun while mending the tire, Mr. Hogg beat a retreat into the welcome shade of a nearby grove.

Here there were perhaps fifty trees, each about sixty feet high, with branches that would have easily overlapped a fifty foot lot. They bore great clusters of pods about a foot long. An Arab sheepherder was under the trees knocking off the pods with a long pole. His sheep were devouring them hungrily and so was he. Traveler Hogg bit into a bean and found his teeth sinking into what was like a perfumed, rubbery gumdrop. It required some chewing, but was palatable, tasting like citron flavored with brown sugar, raisins and honey and suggesting a rather coarse kind of candy. He learned from his guide that the fruit is the staple food of millions of Arabs and that without it Arabic domestic animal husbandry would come to an end.

Returning to the Mediterranean countries nearly thirty years afterward, Mr. Hogg found that the cultivation of the tree had been greatly extended. Where he had previously seen bald hills and treeless plains he now observed forests of Carobs, which in addition to their fruit, are planted for the control of soil erosion. Also, the hard, close-grained wood is used for furniture, tool handles, stocks for firearms and numerous other purposes. The sugar in the pods, amounting to more than forty percent, is now in strong demand by confectioners and bakers in those regions, and it is said that honey-like Carob syrup now appears on millions of European tables. It is esteemed for its high nutritive value as well as for seasoning and flavoring a wide variety of breads and cakes.

However, the heaviest demand is still for livestock, and it is stated that always there is a profitable peace-time market for carob beans in England, Holland, Denmark and other European countries having a large population of domestic animals. The answer to questions as to why the bean has not been cultivated to any extent in the United States is that American farmers have been so preoccupied with numerous crops going into established markets that few of them have been receptive to suggestions that they try something entirely new to their experience. This is in line with general agricultural history in this country. Progress in adopting foreign plants has been slowed by suspicion of the unknown. This has been true of citrus fruits, figs, tung trees, eucalyptus trees and numerous others which have eventually proved to be of great value.

Carob trees had the attention

of the U. S. Department of Agriculture as long ago as 1860, and experimental plantings have been developed into groves. One of the largest of these is in Santa Barbara County, California, where 600,000 pounds of pods were harvested and sold last year at the reported price of seven cents a pound to a single manufacturer of a nationally known stock feed. The most recent large importation of Carob trees came from Spain in 1911 and was left at the Department of Agriculture's Foreign Plant Introduction Station, Chico, Calif. The Department has available a four-page leaflet containing an outline of the economic importance of the tree in Mediterranean countries and assuring the reader that it will thrive and bear in all parts of the United States where the annual rainfall is six inches or more and where winter temperatures do not ordinarily fall below 15 degrees. Also in the leaflet is an analysis of the nutritive value of the carob pod for livestock.

Because of the enormous taproot that makes the Carob a drouth resisting tree, the nursery stock is cultivated in tin pipes five inches in diameter and five feet long. Young trees, pipes, and all, are transplanted in holes dug with a post auger.

By the time the tins disintegrate the trees are firmly established. They require some minor care and watering during the first three years, but after that will shift for themselves.

It is said that a five-year-old tree will produce from four to five hundred pounds of fruit and that when it is fifteen or sixteen years old, its yearly yield may be as much as three thousand pounds.

Dr. A. Aaronson, head of the Jewish Agricultural Experiment Station at Tel-Aviv, Palestine, where a great deal of citrus fruit is produced, says that the American stock farmer who lives where the climate is right, will do well to plant Carob trees.

One Step in Place of Two

Condensed from American Agriculturist

Ralph Space

Central New York Dairy and Poultry Farmer

BECAUSE I have been asked to write this article on what farmers can do to save labor under today's conditions, I would like to outline changes I have made in my own farm business which have resulted in much greater labor efficiency. Several years ago, before the advent of electricity and its allied conveniences, this farm was a 150 A.-18 cow dairy farm with a very small amount of cash crops which took the full time of two men. During the year 1940 the same farm carried 18 milking cows, about 14 or 15 heifers being raised for replacements and sale, 850 laying hens, and 90 acres of crops, mostly feed crops being raised for livestock. The labor required to do this work this year has been my own full time and about 100 days of hired day labor and some family help used in the care of the eggs for market. As figured up by the Department of Farm Economics at Cornell, the man equivalent of this business was 1.5 men with an actual labor accomplishment of 430 work units (day's work) per man per year.

I think the main reason why we are able to operate the farm at this rate of efficiency is because the combination of a fall freshening dairy and a sizable flock of poultry offers a sequence of work throughout the year with a sort of dovetailing of peak work periods which do not overlap. For instance, starting in the late winter there is the chick raising which is well along before spring crop work begins. Then the spring field work, haying and harvesting when many of the cows are dry, followed by the housing of the early hatched laying pullets before silo filling. Then comes the freshening period for the cows with the calves to start and the flush of milking through the fall and winter. As the crops are finally harvested, any additional good weather in the fall is used to get most of the plowing done. Thus you can see this organization of enterprises makes every month of the year a busy one with its resulting good use of labor.

You will be interested no doubt in the labor saving devices and use of electricity that are made

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use of on our farm. In the crop work I have a standard line of horse-drawn farm machinery which is supplemented by hired tractor work in fitting the soil for sowing and planting. In the dairy barn, work is lightened by litter carrier and manure spreader, milking machine, electric hot water, milk standardizer and cooler in the milk house; water buckets for all cattle and horses. The young cattle run loose in pens that are cleaned out only occasionally by hired day help.

Labor in caring for poultry is saved with electric heaters in all pens, also running water to the pullets' range in summer. Handy storage for litter and good floors in the laying pens make cleaning the hen houses a short job by a hired day-hand as required. Handy arrangements for feeding and gathering the eggs contribute greatly to our ability to care for the flock at a minimum of chore time.

I realize that the methods and changes which have helped give more efficient use of available labor on my farm might not prove a panacea to other farms or types of farming. I merely give them as suggestions. Each and every farm is an individual problem.

The acute farm labor situation which will undoubtedly accompany the already expanded defense program of this country offers a challenge to the dairy and poultry industry of the Northeast. They are the farmers sure to be hardest hit by this new problem of agriculture, because they are located in the nation's most intensive industrial area, where the competition for labor for defense work and other accelerated industries will be most intense. However, there is one bright spot in the picture; that is, it is always during periods of rapid industrial expansion that the dairy and poultry industries prosper from the increased demand for their products by busily employed urban folks. This so-called rapid industrial expansion, nevertheless, should not allow us to believe the increased demand will be long lasting, for we know it is only a spurt most apt to be followed by depression.

How can Northeastern agriculture meet this challenge, we may well ask. How can we pay the higher wages demanded by farm workers? How can we get along without help during rush periods of farm work? These are pertinent questions farmers are asking themselves today.

Let us look for a moment at the long time history of agriculture in America and see if we do not have an answer. If we do not find an answer, I will be ready to say that Yankee ingenuity is not what it has been "cracked up to be." To go back to the days following the Revolution, we find that the major pro-

portion of the country's population lived on farms, and produced only a limited amount of excess produce to feed and clothe a minor fraction of the people then living in cities. As time went on efficiency in the production of foodstuffs and fibre has continued to the point where only a small share of the people are living on farms, and they—because of modern methods, more productive livestock, etc.—have been able to feed well the great mass of people who live today in cities. The very fact that this increasing efficiency of farms has been a trend carrying through the years leads me to believe that by merely taking advantage of it our agriculture can survive and profit by the very labor conditions we now face.

Breeding Stimulant

THE Stevenson Ranch in California's San Joaquin Valley, with a flock of 1,130 ewes and 30 bucks, increased the usual crop of lambs 20% by injecting one-third of the ewes and all the bucks with the hormone Gonadin, made from the blood of pregnant mares. An earlier and shorter lambing period was another result.

Horse breeders have found two benefits from the hormone injections—increased fertility and control of heat periods. Some race horse breeders have used hormone injections to regulate the period of heat in mares so that they will foal by February or March, thus affording better development over other two-year-olds at the beginning of the racing career.

Sterile Bulls Restored

From three months to three years have been added to the stud use of stallions and bulls by the hormone. R. R. Thalman, of the University of Nebraska, has detailed records of the use of the hormone on bulls that had become sterile. After a good three-year breeding record, one bull became sterile. Two hormone injections, 19 days apart, restored him to 100% efficiency.

Similar results were obtained on a number of bulls brought to the university dairy department, and on their own stock. Two of the university's aging dairy bulls injected with the hormone were brought back to breeding form from total sterility four times.

—*Farm Journal*

They Tore Their Pastures to Pieces

Condensed from The Farmer

PASTURE renovation as it is done on some western Wisconsin farms appears at the outset to be harsh treatment on the pastures, but when the new growth comes on it is not at all uncommon to have pastures that support two head or more per acre. Take the Henry Notham pasture near Waterville, Pepin County, as an example. Mr. Notham had a hillside totaling about five acres that was getting quite bare. Soils tests showed a need for lime and phosphate so he applied two tons of lime per acre and 120 pounds of a 65% superphosphate. The land was disked and spring toothed and seeded with a mixture of medium red alsike and sweet clover, alfalfa, red top, and timothy. The five acres thus treated now produce more pasture than does an 18-acre adjoining pasture.

W. A. Schleiker of near Alma, Wis., had an experience similar to that of Mr. Notham's. He had a three and a half acre hillside on which he was running 15 head of cattle only two weeks at a time during the summer with long intervals between pasture periods. It was sod-bound and weedy. He disked and dragged that hillside three times, applied two tons of lime and 250 pounds of an 0-20-10 mixture and seeded it with a grass mixture. The first seeding was in 1936 and he didn't get a catch then because of the drouth, but he got a good start in 1937, and in the three years since the pasture has carried 15 head of cattle from June 1 until late September.

On the Schleiker farm is another small piece of grassland which was renovated and reseeded in 1938. In 1939 that piece yielded two tons of hay per acre and in addition furnished pasture for 15 head of cattle from August 1 to October 1.

Both of these men emphasize the need of doing a thorough job of ripping through the old sod either with a spring tooth or disk or both. On their pasture land heavy applications of fertilizer also were needed, but without thoroughly tearing up the old sod, fertilizer wouldn't give the new seeding the start it needs.

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Keeping Celery High in Quality

Condensed from Better Crops With Plant Food

L. H. Hartwig

Columbia, Missouri

TYPICAL of Pennsylvania's many outstanding truck farmers is Frank Haug, of Lycoming County. His garden crops are equal to or better in quality than any grown in the State. The standard of the 18 acres of celery which he grows each year is particularly high.

State agricultural extension specialists, whose advice Haug has followed more than once, like to point to his methods as the kind that produce results, the kind they like to see other growers follow, for they know full well that only by the right practices can reasonable profits be made on this ticklish crop.

The Haug farm is located alongside the swiftly flowing Susquehanna river in a picturesque setting not far from the city of Williamsport. The soil is black and fertile, not too sandy, but just the sort that it takes to grow the kind of celery critical customers like.

Green cover crops are grown and plowed under to improve the organic content, but that isn't enough. Every year an attempt is made to apply at least 20 tons per acre of manure from a cattle feedlot. This is spread in late winter or early spring.

Every year, within a week before the plants are to be set in the field, a ton per acre of a 5-10-5 fertilizer is applied. This is worked well into the soil. If it so happens that insufficient barnyard manure is available, a side-dressing of 300 pounds per acre of the 5-10-5 fertilizer is made. The soil is tested regularly, and lime applied when necessary to keep the ground nearly neutral.

On medium loam soils receiving manure or on clover sods, the Pennsylvania Experiment Station actually recommends 1,000 to 1,250 pounds of 3-12-6 or 4-12-4. Where no manure or clover sod is used, they recommend 1,250 to 1,500 pounds of a 3-12-6 per acre, and on sandy loam soils they recommend 1,200 to 2,000 pounds of a 3-12-6 or equivalent amounts of plant food in another analysis in the same ratio.

Although Pennsylvania has very few muck soils as compared

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to other States, its recommendations for celery grown on recently cleared muck are 2,000 to 2,500 pounds of a 3-12-18 per acre or from 3,000 to 3,750 pounds of a 2-8-12. Where grown on muck soils which have been well fertilized for 10 years or more, they recommend from 2,000 to 2,500 pounds of a 4-8-12.

What kind of celery does Frank Haug grow? His years of experience have taught him that for his market, Emperor fills the bill most satisfactorily. There are a number of varieties that might do almost as well, but not quite. California Pascal, for example, would be easier to handle, and would perhaps meet with the satisfaction of many buyers, but it lacks the fine quality and crispness of the Emperor variety.

Haug has found that he can secure the best results by growing his own plants, so he does just that. And it takes a good many plants to set 18 acres, about 425,000 to be more or less exact. The seeds are started in steam-sterilized soil. Plants started in unsterilized soil begin life with at least one strike against them. As a precaution against molding of the seeds in the seedbed during germination, the day and night temperatures in the greenhouse are kept as nearly as possible at 60 degrees Fahrenheit.

Now here's the thing that has done perhaps more than anything else to place Frank Haug among the top-notch celery growers. It's the rigidity with which he goes about controlling insects and disease. Actually, he doesn't control insects or disease. He absolutely prevents them from gaining a foothold by carrying on a continuous, relentless battle against possible infection or infestation.

Spraying begins at the time the plants are in the seedbed. From then on they're sprayed weekly, depending somewhat of course upon the diseases or insects that may threaten. As a result, his crop is as free of blight as it is possible to make it, and it is absolutely uninjured by insects. The usual practice is to spray weekly with a 4-4-50 mixture of freshly mixed bordeaux, applied with a high-pressure sprayer. Between spray applications, sometimes as often as once a week, the plants are dusted with a mixture of 44 pounds hydrated lime, 44 pounds superfine sulfur, and 12 pounds monohydrated copper sulfate for the control of tarnished plant bugs. Application of this powder is not made regularly, but is dependent upon the threat of danger.

The first marketable celery is grown for the market in hotbeds, with the first plants going to the field about May 10. Marketing usually begins about the latter part of June and continues until Christmas. Most of the crop is sold on the local Williamsport

market where Haug has a stall at the farmers' market which is open for business every Wednesday and Saturday. By this time, buyers are well acquainted with the quality of the Haug celery, and so he bumps up against little difficulty disposing of his crop at reasonably profitable prices.

Another thing that insures quality in the crop is that it is irrigated regularly when nature fails to supply sufficient moisture. A semi-Diesel motor pumping water from a well at the rate of 300 gallons per minute supplies all the water needed. The entire truck farm is equipped with an overhead sprinkling system that makes watering the crop merely a job of starting the motor and turning a few valves.

Even though the waters of the Susquehanna are so near at hand, Haug is careful to use well water for irrigating his crop.

Paper cuffs are used for bleaching the crop. Depending on the weather, these are placed around the plants 2 or 3 weeks before the time of harvest. That gives the plants a chance to take on the desirable color that pleases customers.

The remaining 7 acres of the Haug truck farm are planted to any other crops that can be grown in central Pennsylvania. These include spinach, carrots, cabbage, peas, beans, and many others, but all receive the careful attention with which the celery crop is handled.

In general, it might be said that Haug's secret of success is the maintenance of extremely high soil fertility and the strict attention to the most minute details from the time the seed is obtained until the marketable products are in the hands of the customers.

Weather Service and the Farmer

Condensed from New Jersey Agriculture

E. R. Biel

Visiting Professor of Meteorology, Rutgers University

IT is hardly necessary to explain the importance of an effective weather service to farmers who have to adjust their activities to weather just as sailors and pilots do. America was always weather-conscious. Thomas Jefferson and James Madison personally maintained and compared meteorological records. These lines intend to summarize some recent changes in viewpoints in one branch of meteorology, weather forecasting, and suggest how farmers could take more advantage of the forecast service rendered by the U. S. Weather Bureau.

Weather forecasting is based upon records of wide areas, continents and oceans, polar and tropical latitudes, on the surface of the earth, and in higher atmospheric levels.

France was the first country to publish official daily charts. The United States followed France's lead in 1871, and today the U. S. Weather Bureau is the greatest meteorological organization on earth.

The basic principle originally guiding forecasters was the study of pressure distribution. Pressure, that means weight of air over a given place, changes unceasingly. The forecaster connecting on a chart all places experiencing equal pressure at a given moment draws "isobars" (lines of equal weight of air). Scientists studied the many types of isobars on countless maps gathered all around the world and found that there are circular formations, saddles, wedges, troughs, rectilinear isobars, etc. Very many experiences have been recorded on relations between pressure configurations and weather conditions, and certain weather types were ascribed to corresponding forms of isobars. Winds circulate counterclockwise around a low and clockwise around a high on the Northern Hemisphere. Wind velocity is the stronger the more crowded the isobars are. Thus, to a given pressure distribution belongs a given system of wind directions and velocities.

Low pressure areas, towards which air masses stream from all directions, are characterized by rising air masses. Regions of semipermanent low pressure are

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so stormy, cloudy, rainy, and foggy, that field culture is very difficult. Regions in the habitual paths of travelling lows offer better conditions for cattle breeding and forestry than for crop raising. The St. Lawrence Valley, the New England States, and Scotland, visited by 150-200 disturbances a year, are famous examples.

High pressure areas, from which air masses stream away towards regions of lower pressure, are characterized by settling air masses, by aridity, and monotonous cloudlessness. Crop farming is only possible by artificial irrigation. As semipermanent high pressure is typical of the subtropics, nearly all deserts on earth are located in these latitudes.

Much effort was spent in studying paths and speed of disturbances. Nearly all of them traveled eastwards, generally using habitual paths. In Europe these paths have even been numbered like highways! Lows "avoid" high mountain ranges and "prefer" seashores or chains of great lakes. The most frequented path of American disturbances runs along the Canadian frontier and across the Great Lakes towards Newfoundland. Other paths also tend toward New England, which thus is the terminus of scores of disturbances before they leave the continent.

American travelling disturbances with an average velocity of 600 miles in 24 hours excel, by far, European or Asiatic lows.

Experience proved that weather conditions of certain regions are of particular importance for the entire North American continent. The best known "centers of action" are the Iceland and Aleutian lows and the Azores and Hawaiian highs.

In spite of considerable progress during this period of development of forecasting methods, the results did not satisfy the great hopes which science held. Moreover, these efforts offered no satisfactory explanations of the nature of travelling disturbances; they were more descriptions of experiences than explanations. Our generation now witnesses a complete change in viewpoints. Norwegian scientists (Bjerknes, etc.) developed a system of "air mass analysis." Their methods gradually replaced everywhere the old "geometry of isobars."

The modern conception of weather is that of battles between airmasses of different geographic origin and of different properties; they do not mix and it is along their fronts that birth and development of disturbances take place and that sudden changes of weather occur. Lows have their individual life histories. They are newborn, developing, aging, and dying. As air masses act in the three-dimensional atmosphere we never can hope for satisfactory

results if all our observations are made in the bottom layer. Identification of air masses is less difficult by means of upper air data because the original properties are better retained in upper levels. Observations there improve forecasting for the earth's surface where oceans, snow covered plains, and mountain systems quickly modify and mask travelling air masses.

The most important American air masses originate over Canada, over the North Pacific Ocean, and over the Gulf of Mexico and the Carribean Sea.

It is important also to know the age of air masses, that is, the time elapsed between start of travel and arrival in the forecaster's district.

Modern weather maps are covered with symbols indicating positions of air masses and of the belts of their approach. These fronts are battlefields of often dramatic developments. Polar Canadian masses control mostly East America's winter. Polar Pacific masses are paramount in the West because the prevailing Westerlies of our latitudes carry them toward the continent. But coastal ranges and Rocky Mountains standing in their path modify them enormously. Transportation of air over high mountains always results in a complete neutralization of characteristics. Gulf of Mexico masses are responsible for the bulk of East America's precipitations, for Polar Canadian masses are too cold for much moisture and Polar Pacific masses lose theirs on the weatherside of the Rockies. Polar Atlantic masses are carried by the prevailing offshore Westerlies toward Europe where they are the most important species, but they are of only occasional importance in New England.

The forecaster's main problem is the study of structure and of laws of movements of fronts. The battles of air masses are on a much more gigantic scale in America than in the Old World. After quick transportation from their source regions Polar Canadian air masses and those coming from the Gulf of Mexico approach each other unhindered and with their original properties. The Alps and the great number of high Asiatic mountain ranges, forming huge West-East barriers, modify advancing masses completely. West to East barriers of this kind do not exist in this country.

A strange consequence of the huge contrasts of American air masses are the strong winds in the interior parts. Plains far from the ocean usually are characterized by only slight winds, but the Great Plains are almost as windy as the coasts. Tornadoes are almost unknown in other continents and the 80 American tornadoes per annum, mostly of frontal origin, are a unique phenomenon.

The verification record of forecasts amounts nowadays to about 85 per cent. But, the convenience of radio forecasts includes a danger which lies neither in the interest of farmers nor in that of meteorology. Undiscussed forecasts do not deepen the understanding of atmospheric phenomena, and most laymen are completely helpless in doubtful cases. The aim ought to be: understanding of the reasons upon which forecasts are based by tuning in to officially discussed forecasts for 48 hours or 5 days (WOR at 6.55 A.M.) and by using weather maps. Observations of the local sky will lead to a better understanding of local weather as part of the general development. By doing so the safety of personal forecasts could be essentially increased if and when they are based upon well understood official forecasts and intelligible interpretation of the local sky.

He Grows Paprika

As a climax to a nine-year search for the right seed, Clarence R. Brown, of Orange county, in southern California, harvested 70 acres of paprika last year. His average yield was a ton of dry pods per acre. Expenses averaged about $175 an acre, including soil preparation, fertilizing, planting, irrigation, insecticide dusting, labor costs and dehydrating.

With seed imported from Hungary, Brown started experimenting with paprika in 1931. From each successive crop, he carefully selected the most desirable pods and used the seed for the following year's planting. He found paprika highly susceptible to cross pollinization with other types of capsicum, and so a careful check had to be made around each selected plant to determine if the area was clear of hot varieties. Finally, in 1939, he produced enough top-quality seed to plant 70 acres. The choicest seeds saved from the 1940 crop made possible a planting of more than 200 acres in March this year.

At least 5,000 acres would be required to grow in this country the normal annual imports of around 5,000,000 pounds from Hungary, Bulgaria and Spain—now halted due to the war. Brown believes his experience marks the beginning of a new and profitable industry, particularly in southern California, Louisiana and Georgia.

—*Farm Journal*

Acetonemia in the Dairy Cow

Condensed from Guernsey Breeders' Journal

R. S. Amadon

University of Pennsylvania

THE term acetonemia is applied to a condition peculiar to the heavy producing dairy cow in which acetone, diacetic acid and beta hydroxy butyric acid are found in excessive amount in the blood stream. The urine also contains a considerable quantity of these three substances, which appear during the course of their elimination from the body. The term ketone bodies is applied to these three compounds.

In consequence of the presence of abnormal concentrations of the ketone bodies in the blood, there is a tendency for a change in the direction of an acid rather than neutral or weekly alkaline reaction. Unusual degrees of acidity in the body cause serious disturbance of oxygen supply to the tissues and thus reduce the efficiency of the tissue cells in performing their work. Acetone is also poisonous to the nervous system. The production of excessive acidity is, however, the most important factor from the standpoint of injury to body function and is responsible for the appearance of the majority of the symptoms.

The question of the source of acetone and other ketone bodies appearing in acetonemia can be answered by reference to the metabolism of fats in the animal body. Under normal conditions the fats are oxidized completely to the end products, carbon dioxide and water, but in acetonemia the breakdown has been incomplete and is stopped at the butyric acid stage. Acetone and diacetic acid are derived from the beta hydroxy form of butyric acid. The failure to metabolize fat completely is considered to be due to an insufficient quantity of carbohydrate in the body in proportion to the fats present. When an abundant supply of carbohydrate is available, the oxidation of butyric acid is accomplished and no concentration of the ketone compounds occurs. It therefore would appear quite reasonable to expect a deficiency of carbohydrate, or a surplus of fats in the diet would tend to bring about acetonemia.

Now let us inquire into the pre-

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disposition of the dairy cow to this disease. The fact must be mentioned at this point that acetonemia also appears under other conditions than those existing within the body of the lactating cow—it develops in starvation, in diabetes mellitus and in consequence of certain drug actions which tend to cause liver damage. In studying all of these conditions, a great deal of difficulty has been experienced in obtaining established data essential to explaining the breakdown of metabolism which occurs. Acetonemia and all metabolic disease conditions constitute the most perplexing of problems under scientific study. The starving animal is using its fat stores for a carbon supply as the carbohydrate has been used early in the starvation period, so the animal is under the same conditions as the one existing under abundant food conditions, but with an excess of fat and deficiency of carbohydrate in the diet. The diabetic patient also is suffering from a carbohydrate deficiency because of the inability of the body to make use, by oxidation, of the food material; therefore, fats are depended upon for the energy requirements. Our dairy cow of today has been bred for high milk production, this accomplishment representing many years of careful selection. Heavy lactation involves a great deal of sacrifice of effort and materials by the body and this in turn requires that certain conditions of diet and health of body tissues be supplied. Regarding diet, it appears that an overabundance of an improperly balanced diet often is a cause of trouble. The guidance of the metabolism of pregnancy and the abnormally high and prolonged milk production by the internal secretions of the body may suffer breakdown under the strain and contribute to a state of acetonemia. At the present time a definite statement cannot be made regarding the underlying cause or causes of acetonemia in the dairy cow, but milk production is an established predisposing cause.

Prevention is of prime importance but is quite difficult to practice with any degree of success. Recognition of the fact that fat is being metabolized with difficulty suggests limitation of fat-rich food in late pregnancy and early lactation. Of equal importance is the provision of a rich carbohydrate diet during the terminal weeks of pregnancy. These modifications in diet are indicated and will aid in counteracting acetonemia if applied sufficiently in advance of the lactation period. Molasses, brown sugar or any concentrated form of carbohydrate available may be fed generously as the means of increasing the carbohydrate supply in the body.

The presence of acetone and

other ketone bodies in the blood can be determined by testing the urine for acetone, as the urinary tract is the portal of escape for these compounds. This test is very important in determining the existence of acetonemia and that it is the cause of the particular symptoms observed. The test is rather simple in application and it might be used more frequently in the extra high-producing cow where acetonemia may be anticipated due to past occurrence in the individual and when the very first appearance of the condition may be detected and treatment applied before serious injury of the body has occurred. The urine of the cow is normally alkaline; in acetonemia it becomes strongly acid. Reaction of the urine can be determined by noting the color change in litmus paper. In the cow that has failed to receive effective treatment and the disease has lasted over one or more weeks, the kidney tissues may suffer damage which results in the appearance of albumin in the urine. Several simple tests for albumin in urine are available and will give information relative to the possibility of successful recovery. Veterinary care of the acetonemic cow is directed to the elimination of the acetone bodies from the body, especially by checking their formation. Dextrose injected into the blood stream has proved quite successful. The author favors the use of two or three eighty-unit doses of insulin at twelve-hour intervals. Insulin acts by stimulating the burning of sugar in the body and thereby causes more complete combustion of fats with no residue of acetone bodies. If appetite can be stimulated, the animal may be induced to eat rich carbohydrate food.

In closing this discussion, it may be well to lay parting emphasis upon the role played by a disturbed carbohydrate-fat balance in the diet of the dairy cow in heavy lactation. Increasing the carbohydrate and reducing the fat is an important preventive measure.

Question: In what form should carbohydrate be used in the diet?

Answer: Molasses or a cheap form of brown sugar can be used.

Question: Is the insulin given before or after an attack?

Answer: It may be used to advantage as a preventive if the condition can be detected before symptoms appear, that is by means of urine tests. The drug always should be used with dextrose to guard against insulin shock and to obtain beneficial action. Insulin also is indicated in treatment of an attack of the disease.

Question: Did we have this ailment forty or fity years ago?

Answer: Perhaps, but it was not recognized as such. It probably

was confused with milk fever, and still may be unless resort is made to urine analysis.

Question: Can the animal have acetone bodies in the urine after calving without having acetonemia?

Answer: A very low concentration of acetone bodies always is present in urine but is not associated with any trouble, and will not give any reaction or a very weak reaction to the acetone test. Such normal urine is alkaline. A strong reaction to acetone and marked acidity of urine are characteristic of acetonemia.

Faster Haying

In putting up hay, Hoosier farmers, Lawrence and Myron Thatcher, say they save an extra man by using their tractor in reverse on the hayfork.

The tractor backs to pull the load into the barn. After sticking the fork, Lawrence rides the tractor and watches the forkful of hay enter the barn. Myron mows the hay away and shouts the signals.

The hay rope at the far end of the barn goes through a pulley fastened to a concrete anchor in the ground, well away from the corner of the barn.

—*Farm Journal*

Progress in Breeding for Fat Tests

Condensed from The Ayrshire Digest

FEW movements are having a more forceful effect on the Ayrshire breed than the planned breeding programs for controlling butterfat tests. Although this subject has been prominent in the minds of breeds since the establishment of the Babcock Test, it was not until a little over a year ago, when the results of investigations by D. N. Putnam and Professor G. A. Bowling were published that an attempt was made to scientifically solve this problem.

Messrs. Putnam and Bowling began their work by prying into the pedigrees of some sixty-six Ayrshire bulls with tested daughters in an effort to find out just what facts in a pedigree might be used as a guide in determining the butterfat test of a young, untried sire's daughters. The results of their studies showed that they were able to predict within 1/10 of 1% the butterfat tests of the daughters of 85% of the sires whose pedigrees were analysed. Furthermore, almost without exception, the daughters of the various sires tested somewhat higher than the prediction.

In the year that has transpired, the Putnam-Bowling principles have been applied to hundreds of pedigrees, and even though it may seem too good to be true, almost without exception, the plans which were devised have proven surprisingly accurate.

In this connection, it should be added that even though the dam's fat test has been considered an indication of the test of the sire's daughters, research has shown that it is perhaps the least reliable factor that is generally used. Furthermore, the work of these investigators also pointed out that even the butterfat tests of the three nearest dams of a sire were not the most valuable points on which to evaluate a pedigree.

Just recently a breeder contacted the Brandon office concerning his herd sire, which had been selected several years ago for the express purpose of increasing fat tests. The average of the three nearest dams in his mother's pedigree was 4.47%. In other words, he was truly from a high testing family. But although used in two different herds, his daughters averaged 4.01% and 4.03%, respectively. However, when his pedigree was analysed according to the Putnam-Bowling plan, it was found that his prediction was 4.03%. Furthermore, his full sisters tested 4.01% and in reality this sire had transmitted butterfat tests

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almost in direct line with his prediction, based on pedigree analysis, notwithstanding the fact that his mother came from a very high testing family.

Dozens of other cases have been uncovered which indicate that breeders may use pedigree analyses, not only as a guide to increase butterfat tests, but also to lower them to a 4% standard, provided they wish to do so. In other words information is now available that should take a lot of guess work out of breeding for butterfat tests at a fairly definite level.

Seven Easy Methods

In an effort to study pedigrees from every angle, seven different methods of analysis were followed, and although they varied to a certain extent in their value in predicting butterfat tests, most of them were surprisingly close. In each case, the pedigrees were first analyzed in an effort to predict the transmitting ability of the bull in question. The so-called theoretical transmitting ability was then averaged with the butterfat tests of the cows to which the bull was (or was to be) mated, in an attempt to predict the tests of the daughters. Presented herewith are the various plans used to determine a sire's "Transmitting Ability."

Plan A—One Generation: Average the tests of the daughters of the sire and the daughters of the dam and average the results.

Plan B—Two Generations: Average the tests of the daughters of the three nearest sires and the tests of the daughters of the three nearest dams, and average the results.

Plan C—Average the tests of the daughters of the three nearest sires and the tests of the three nearest dams. Note only the test of the dams and not the test of their daughters is used.

Plan D—Average the test of the daughters of the three nearest sires. The female side of the pedigree is not considered.

Plan E—Average the tests of the three nearest dams. The male side of the pedigree is not considered.

Plan F—Average the tests of the daughters of the sire and the test of the dam.

Plan G—Average the tests of the daughters of the sire and the tests of the daughers of the sire of the dam, and average the results.

Putting Plant Food to Work

Condensed from The Fertilizer Review

DURING the past 20 years tremendous strides have been made in the direction of better fertilizer application and use.

The research program which has been sponsored by the National Joint Committee on Fertilizer Application since 1925 has reached into 38 states. More than 250 experiments have been conducted on most of the crops on which fertilizer is used.

These results show that for row crops fertilizer should not come in contact with the seed or with the tender roots of young plants. Neither should it be placed directly under or over the seed. When fertilizer is placed in contact with or too near the seed, sprouting may be delayed or prevented, and, if the seed does sprout, the young roots may be injured.

The different plantfoods move in the soil at different rates. The phosphates move very slowly, since they are fixed and held by the soil to a large extent. The potash salts move some, and the soluble nitrogen compounds move rather rapidly.

Injury from fertilizer application too close to the seed is largely dependent on the weather. For this reason, injury does not occur every year. If rain follows planting, fertilizers move down away from the seed and there may be no injury.

In dry weather, fertilizers, although applied two or three inches below the seed, are pulled upward by capillary attraction, and may injure the seed or roots. When fertilizers are placed to the side of the seed or plant, they move up or down without injury and only with benefit to the crop. Of course, the roots get the fertilizer when they are stronger—it is only during very early growth that they are easily injured.

Potatoes

Experiments conducted in Maine, New York, Virginia, Ohio, Michigan, and other States show that fertilizer should be applied on both sides of the row about 2 inches from the seed and a little below seed level. Most potato planters on the market now apply the fertilizer in this way.

Potatoes are sometimes planted by hand, and the fertilizer is applied in the furrow with a one-row distributor. With this method, the fertilizer frequently comes in contact with the seed and delays or prevents germination.

Side application gives good results in all seasons; it is, in fact,

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a form of crop insurance. Thousands of planters now in use can be modernized for side application by merely buying a new fertilizer attachment.

Experiments show that proper application increases the average yield of potatoes by 25 to 30 bushels per acre with no extra cost for fertilizer.

Beans

The bean crop is sensitive to fertilizer injury and requires careful application to obtain the best results. This applies to all beans, whether they are snap beans, lima beans, or white beans. In an experiment at the Virginia Truck Experiment Station snap beans were fertilized with 1,000 pounds of a complete fertilizer per acre. The rows that were fertilized at the sides yielded one-third more on an average of several years' results than the rows that received the fertilizer in contact with the seed.

Sweet Potatoes

For sweet potatoes fertilizer should be applied 4 or 5 inches to each side of the row and about 4 inches deep, or it can be side-dressed after planting in about the same location.

An experiment conducted at the Delaware Experiment Station shows that when the fertilizer was too near the plants early growth was delayed and the stand was reduced, but where the fertilizer was applied in bands the same amount and grade of fertilizer produced 47 bushels more per acre. Similar results have been obtained in Maryland and Virginia.

Cotton

Even though fewer acres of cotton are being grown now than formerly, it is still the largest consumer of fertilizer of any crop grown in the South.

The usual method of fertilizing cotton is to put the fertilizer down and bed on it, preferably a week or ten days before planting. The fertilizer is mixed more or less with the soil, but in general it is under the seed. This method has given very good results. However, many experiments conducted since 1929 all the way from North Carolina to Texas have shown that application in bands about 2 inches to each side of the row and 2 inches below the level of the seed has increased the yield by 100 to 300 pounds of seed cotton per acre, as compared with the ordinary methods of application.

Many cotton growers all over the South are adopting the new method of applying fertilizers, and there are a number of machines on the market that place the fertilizer in bands satisfactorily. Some of these machines put the fertilizer on one side of the row only, but experiments have shown that this is all right for cotton.

Tobacco

Tobacco is one of the most sensitive crops, and for high yield and good quality everything from growing the plants to harvesting and curing the leaf must be done just right.

As with cotton, the usual method of applying fertilizer in the South is to put it down in a furrow and mix it with the soil before setting the plants. This method has given good results; in fact, tobacco growers have obtained higher returns from fertilizer use than most other farmers.

Nevertheless, when fertilizer is applied in bands on both sides of the row and slightly below the root crown of the plant, the results have been even better. Machines are now available that do the whole job—apply the fertilizer, set the plants, and water them. Other machines are available that apply the fertilizer in two bands and throw up a bed so that plants can be set by hand between the fertilizer bands later.

Twelve experiments conducted in North Carolina, South Carolina, Georgia, and Maryland show the value of the new method. When the fertilizer was applied in two bands at the sides of the row, the average yield was 1,378 pounds of tobacco per acre worth $306.

When the small amount and kind of fertilizer was mixed with the soil in the furrow, the yield was 1,213 pounds worth $259. The increase in yield was 156 pounds and in value $47 per acre.

Small Grains

In fertilizing crops which are grown in general rotations, such as corn, the small grains, and legumes, both farm experience and experiments have shown that it is a good plan to start with a liberal application on the small grain crop. All of the small grain crops are greatly benefited by applications of fertilizer, which, by the way, give best results when drilled with the seed with the standard fertilizer grain drill.

The fertilizer that is applied to the small grain crops aids in getting a good stand of clover or of alfalfa and increases the yield of hay or pasture or of grass silage the following year. There is also an increase in root growth and a sod to plow under which adds a lot of organic matter and some nitrogen to the soil.

The fertilization of wheat, oats, barley, and rye in the South is about the same as in the North except that in the South top-dressing in the spring with a nitrogen fertilizer is a more common practice and usually pays well.

Corn

When there is a good sod to plow under, hill or row application of fertilizer on corn gives better results than on soils that are low in fertility and lacking in organic matter.

The modern corn planter places the fertilizer in two bands with soil separating the fertilizer and the seed. The depositor divides the fertilizer stream and protects the seed until it is covered. Corn fertilized in this way comes up quickly with a good stand, grows rapidly, and is easy to cultivate.

When fertilized with the old-type planter which allows fertilizer to come in contact with the seed, corn usually comes up slowly; and, if dry weather follows planting, there may be considerable injury to the stand.

In addition to the hill or row application, many farmers also broadcast fertilizer containing phosphate and potash before planting and some farmers side-dress with nitrogen or with potash on certain potash-deficient soils, or with complete fertilizer.

The experiments conducted at the Ohio Experiment Station show how important proper application really is. Without fertilizer, the yield per acre was poor and half of it was nubbins. The corn which was fertilized with the old-type planter produced nearly twice as much sound, marketable corn, but when the same amount of fertilizer was supplied in two bands with the new-type planter the yield was 8 bushels more per acre.

Many southern farmers expect their corn to get along on left-over plantfood, that is, on that which the cotton crop did not use. But all too often the cotton does not receive enough plantfood and there is nothing left over for the corn.

Side-dressing, especially with nitrogen, pays well. It is usually applied by hand but can also be applied with a distributor or cultivator attachment.

On the average, according to the testimony of 12,500 southern farmers, fertilizer used on corn doubles the yield.

A "Home-Made" Method of Applying Fertilizer in Bands

Some farmers who do not have machines are placing fertilizer in two bands by using a plow and an ordinary fertilizer distributor. Two furrows are opened for each row, throwing the soil away from the center of the row, but leaving about 6 inches of undisturbed soil between the two furrows. Fertilizer is then applied in each furrow with a one-horse distributor. The bed is then completed in the usual manner and is ready for planting cotton or corn or for setting tobacco or other plants, or a furrow can be opened between the fertilizer bands for planting potatoes.

Peanuts

Experiments conducted at Holland, Virginia, show that application of fertilizer at the sides of the peanut row at planting time gives better results than application on top of the row after the plants

were up, that being one of the local methods used. The increased yield due to the side placement amounted to 400 pounds of peanuts per acre.

Soybeans

The soybean crop has grown to enormous size within the past few years and many farmers are interested in producing higher yields—hence in using fertilizer. The seed is easily injured and, therefore, fertilizer should not be applied in contact with it.

When soybeans are planted in wide rows to cultivate, a modern corn planter can be used very satisfactorily, but when drilled in close rows with an ordinary grain drill, it is better to drill the fertilizer separately before planting and preferably at right angles to the bean rows.

The Vegetable Crops

The vegetable crops, because of their high-acre value, are usually fertilized more heavily than field crops. Proper methods of application are especially important to insure earliness, high yield, and good quality.

The tomato crop, for example, responds to fertilizer from the time the seed is sown to the picking of the ripe fruit. The production of good plants is important. Many plants are grown in the South and shipped to all sections of the country. The tomato seed is planted in narrow rows, the fertilizer being applied in a band at one side of the row. Many growers use machines that set the plants, fertilize, and water them in one operation.

There are other methods of fertilizing tomatoes. In some cases heavy broadcast applications are recommended, and good results have also been attained by side-dressing a part of the fertilizer, the nitrogen and potash in particular.

Peas

Peas are especially susceptible to injury when fertilizer is drilled with the seed. For best results the fertilizer should be placed in a band to the side of the seed, and if a drill is not available that will do this, it is better to drill the fertilizer before planting at right angles to the pea rows.

In a Michigan experiment, fertilizer applied slightly to one side of the pea rows produced 960 pounds more shelled peas per acre than when applied in contact with the seed.

To Fight Alfalfa Wilt . . .

Condensed from Successful Farming

Leonard Westrate

GROWING alfalfa? Then it is almost a foregone conclusion that sooner or later you are going to meet with *Phytomonas insidiosa,* or, as it is known in common language, alfalfa wilt. Perhaps you have it even now and don't know it. If you find your alfalfa stands flickering out the second or third year and dotted with squatty, wilted, yellow plants, then you are pretty likely to be entertaining it unawares.

The disease is known to exist in 30 States, from Connecticut to California, from Alabama to Oregon, and is no respecter of state borders. The menace is a real one; losses as high as 90 percent killing-out in three years have been reported. What, then, are we going to do about today's alfalfa wilt?

Pathologist J. H. Muncie and Crops Professor C. R. Megee, both of Michigan State College, went into a huddle two summers ago and laid plans for a grand jury investigation of this alarming threat to the leaf and limb of the state's million acres of alfalfa. Out of two years of investigation they have come to believe that we can live with the wilt, even if we can't exterminate it entirely.

Here are the results of their investigation:

The story of its mushroom outbreak in Michigan reads like the fantastic epic of modern parachute invasion. In powder-dry 1936, Michigan was overblown with the tag ends of several Western dust storms. Classification of silt deposited on window ledges revealed that the soil was a type found only in Oklahoma, where alfalfa wilt was already widespread. The following year, 1937, found alfalfa wilt reported in all sections of the state. The general guess is that it came by the most modern way of travel—air.

Now let's look at the cause of the disease. Alfalfa wilt is caused by a species of bacteria which get into the water-conducting system in the root of the plant. Here they multiply swiftly and, because of their great numbers and a gummy substance which they secrete, plug up the water channels. Passage of water upward is greatly hindered or stopped altogether. This is what causes wilting and yellowing of the leaves and stems. Eventually the organisms work up into the stems

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and provide a source of field infection. Infected plants are stunted, gray or yellow, with leaves dead or upturned at the margin, and usually shoot up a large number of short, spindly stems.

Because plants are runty, they may be overlooked among the healthy larger plants. But it really is the root that tells the story. When you see a suspicious top, dig up the plant and cut it lengthwise thru the crown and root. If it shows yellowish to brown streaks or deposits of slime, you have the infallible proof of wilt. If cut crosswise, the cut section will show yellow to brown flecks near the outer edge. In advanced cases, the root becomes badly rotted and filled with bacterial slime.

Spread of the very infectious alfalfa wilt bacteria comes about in several ways. The cutting bar of the mowing machine is probably one of the chief offenders in carrying the bacteria from plant to plant and from infected fields to healthy ones. Muncie and Megee were able to infect healthy plants by cutting across the stem with a razor blade dipped in a suspension of the wilt bacteria.

Wilt-free fields should be cut before infected ones, if possible, to avoid infection. When it is necessary to cut a diseased field first to save the hay crop, mower infection can be greatly reduced by disinfecting all cutting parts with a formalin solution of one pint to fifteen gallons of water. Cutting when plants are dry lessens the chance of contamination.

Another way in which the germs are spread is by run-off water from infected fields draining into healthy ones. In this way the bacteria gain entrance into the roots thru injured bark or split crowns.

While it definitely has not been proved that the organism is carried on the seed, it is strongly suspected that this may be another source of infection. It is known that the bacteria will live inside the stem in dry alfalfa hay for a period of at least five months and it is possible that organisms from stems broken in threshing may adhere to the seed coat. Megee and Muncie are experimenting with seed treatments, but as yet have no definite results. There is no indication that the inside of the seed is affected by the wilt organisms. Infected plants almost never set seed, anyway.

Being a bacterium, the organism requires considerable moisture for its best development. Hence, sowing alfalfa on lighter, sandier soils and in high places with good drainage tends to retard the disease. Other recommendations include sowing smooth brome grass with alfalfa to reduce spread of the wilt in cutting; using good, certified winter-hardy seed; avoiding late season cutting or pasturing with at-

tendant injury to plants, making them more easily accessible to the bacteria; refraining from top-dressing alfalfa with manure from infected hay or trash from an infected field; and waiting until old roots from diseased plants are thoroly decayed before planting the field to alfalfa again. This usually is a period of about four years.

Another line of attack on the problem is the use of resistant varieties. In Michigan, Ladek has proved superior to other varieties by withstanding the wilt for a longer period of time, but eventually it, too, succumbs, usually after about three years. Professor Megee says that pathologists and plant-breeders are working on varieties which are highly resistant, and eventually may develop a good commercial variety which will be more resistant to wilt than any now available.

One saving grace of the costly little wilt microbe is its choosy habits of abode. It will not attack any of the clovers except sweet clover. So if you just can't get the best of it in your alfalfa, you always can turn to the clovers for a while, at least until you starve out the organism.

It must be remembered, of course, that as yet everything is not known about alfalfa wilt and its control. The recommended practices are not guaranteed controls; they merely are practices which have shown a tendency to retard the growth and spread of the disease.

Montana Plan of Crop Standardization

Condensed from The Reclamation Era

Ralph D. Mercer

Extension Agronomist

THE successful operation of a crop standardization plan in any State depends upon two elements; first, the plan must be complete and practical and, second, it must have enough appeal to the producer to create a desire on his part to become a working unit in the plan. If the plan is complete there will be a stage or step in its development where every producer in the State may fit in.

The Montana plan of crop standardization operates in the following manner: Developed and organized in 1921 by the late A. J. Ogaard, then extension agronomist with the Montana Extension Service, this system has continued to operate through the years with only minor changes. The plan has three distinct phases, (1) obtaining the facts on the relative merits of new varieties and placing the proper interpretation on their value, (2) demonstrating the value of standard varieties in the field, and (3) development of the plan in the State and county.

The success of such a plan depends upon the co-operation of individuals, organizations, and departments. No single unit can or should take all the responsibility for its operation. However, definite leadership is required and in Montana the extension service has assumed that leadership. Responsibility for various phases in its operation is placed with the agency best equipped to handle each.

Certifying Agency

The certification work in Montana is carried on by the Montana Seed Growers Association, a semiofficial organization with a membership consisting of actual seed producers. The business of the organization is handled by a board of directors, elected by the members, with each of the four districts in the State being represented on the board. The extension agronomist serves as secretary of the board and the records of the association are in the extension agronomy office. The association is financed by fees and dues collected from the growers. All inspections, grading, sealing, and tagging of lots of small grains

Reprinted by permission from The Reclamation Era, Washington, D. C., May, 1941

and small seeds are handled by representatives of the association.

The Montana Experiment Station has the responsibility of gathering the facts. Through breeding work, and the testing of varieties for the many factors that must be considered, including baking and milling qualities, the experiment station keeps the records on such performance up to date at all times. From results obtained by the Montana Experiment Station and experiment stations of adjacent States, the agronomy department interprets these results and makes recommendations to the Montana Seed Growers Association for varieties to be included in the list of standard types.

Demonstrations of Varieties

The performance of varieties in the field is essential for their general adoption. It is also desirable that the results obtained on the Montana Experiment Station be supplemented by performance in the field. To obtain both, the extension service, in co-operation with the agronomy department of Montana State College, carries on small grain nurseries and variety tests in many counties in the State each year. These tests have done much to hold to a minimum the number of small grain varieties on the standard recommended list.

By such a method the agronomy department, both college and extension, co-operates very closely with the Montana Experiment Station in supplementing the data which apply to a limited portion of the State. This limitation results from the location of the home station as well as branch stations. In like manner the agronomy department is co-operating with the county extension agents in establishing a basis for accurate recommendations for the counties. With all the information at hand assembled and analyzed through such a series of tests the Montana plan is ready to go into operation in the field.

The agronomy department is responsible for the production of all foundation seed of small grains. This applies to those already on the standard list as well as to new varieties. When supporting evidence indicates that a new variety may have a place on the standard list, the agronomy department starts making head selections in the production of foundation seed. By the time the variety is recommended to the Montana Seed Growers Association for certification, there is a small supply of foundation seed ready for distribution. All foundation stock is released to the Montana Seed Growers Association for increase in the field.

As it is imperative that precautions be taken to prevent the loss of foundation seed, and to obtain the best methods possible in production, all foundation seed is placed with elite growers.

There are only two such growers in the State at present and, strangely enough, these two producers have been seed growers since the beginning of certification work in Montana. Their contribution to the production of quality production over a span of 20 years has far outweighed the remuneration they have received. For that reason it would be well to record their names for they have done a big piece of work. One is Hans B. Erickson, a director of the Montana Seed Growers Association, who farms near Conrad, Pondera County, in the western part of the State, and the other is Karl Reddig, of Frazer, Valley County, in the north central part. From the production of first generation seed produced by these men from the foundation stocks received from the agronomy department many producers of registered seed obtain their seed.

Both elite and registered seed is inspected, graded, and tagged by the Montana Seed Growers Association. The responsibility for the marketing of a quality of seed equal to or better than the grade established from the representative sample has always rested with the producer. The original plantings of registered seed are always obtained from the foundation and elite seed stocks. However, registered seed may be produced from other registered seed supplies. Producers are encouraged to go back to elite seed stocks after four generations of production. Up to this point in the plan more attention is paid to quality than quantity production. It is realized, however, that volume production must be incorporated if the plan is to be practical.

To attain volume as well as quality production, the Montana plan provides for an approved seed class. This class of seed is produced by the grower under the supervision of the county extension agent. This acreage in a county will run in a ratio of 10 or 15 to 1 with registered acreage. To be eligible for approval the acreage must be planted with registered seed.

While the regulations for the production of approved seed are more lenient than those of registered production, all the extension agents in Montana hold their growers to the same rigid requirements. The extension agent and the grower make the inspection together, and together they decide whether a field is worthy of approval. It so happens that most registered growers are carrying some fields for approval so they understand very well the requirements and produce excellent grades.

In reality the only difference between registered and approved seed is the supervision and absence of fees. In many cases the larger producers carry a field of

grain for registration for their own seed the following year. The acreage planted with approved seed goes to market.

The test of such a plan is whether it produces results when put into operation. The fact that this system has been in operation for the past 20 years with the occurrence of very few changes should be sufficient recommendation.

Although there is not 100 percent participation in this plan by the producers of market grain, the results are in no way discouraging. Educational work on such a project is continuous. A few sidelights will probably help to make its value more convincing.

The agronomy department of Montana State College adheres to the policy of recommending varieties to be included in the standard list only after very thorough testing both in the field and in the laboratory. By doing this the list is held down to a small number of varieties. At present, for instance, there are only six varieties of spring wheat recommended for the entire State.

Thirty-three counties of the State carry a self-sufficient crops program whereby enough registered and approved acreage is planted to take care of their own needs. Five other counties produce a surplus to supply counties where production of this quality wheat is difficult.

There are 10 counties in which over 90 per cent of the grain marketed has been produced from registered and approved seed. In the remaining counties the percentage is high.

By the Montana plan it is possible to change the entire acreage from one variety to another in the course of 3 years. For this reason the release of new varieties does not present a difficult problem in Montana.

With such a plan operating in the State through the past twenty years it has been possible for Montana to maintain at a high level the production of quality grain. Through all these years the slogan of the "Montana plan" of crop standardization has been and still is "Know what you sow."

Horse Sleeping Sickness

(Equine Encephalomyelitis)

Condensed from New England Homestead

THE following questions and answers prepared by the Division of Livestock Disease control, Massachusetts Department of Agriculture, gives a pretty complete story of Equine Encephalomyelitis—Horse Sleeping Sickness.

What is horse sleeping sickness (equine encephalomyelitis)?

A disease affecting the brain and spinal cord of horses and mules.

What is the cause of horse sleeping sickness?

Small living organisms (bacteria) called a filtrable virus.

How is sleeping sickness spread?

Probably by mosquitoes and other blood-sucking insects.

At what season of the year does sleeping sickness occur?

During the summer months.

Under what conditions are horses most apt to contract this disease?

If at pasture all or part of the time, especially if pastured at night.

Are fly nets, fly sprays, and screening of barns of any value as preventives?

Any method of preventing contact with mosquitoes is undoubtedly of value.

Can a horse be protected against this disease?

Yes. A vaccine is available which, if given before contact with insect carriers of the disease, is effective in preventing the disease.

When should horses be vaccinated?

As soon after May 1st as possible.

How long will this vaccine protect a horse?

Experiments indicate that two injections of vaccine, 7 to 10 days apart, will protect a horse for at least six months. It is advised that a horse vaccinated in the year 1940 be vaccinated again in the year 1941.

Has horse sleeping sickness been reported in Massachusetts?

Yes. Approximately 300 horses in Massachusetts died in the summer of 1938. Thirteen (13) horses were reported in the summer of 1939, 5 of which died.

How do you account for the decrease in the number of cases in the year 1939?

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The summer of 1938 was warm and damp, weather favorable to the propagation or growth of mosquitoes. Also, very few horses had been given preventive vaccination.

The summer of 1939 was unusually hot and dry and a large number of horses (approximately 14,000) were given preventive vaccination.

What are the principal symptoms of sleeping sickness in horses?

Difficulty in eating and swallowing—hanging head—lips hang down—foul smelling breath—eyelids reddish yellow in color—staggering gait—leans against walls, fence, or posts—finally gets down (cast)—thrashing—death.

Are the symptoms alike in all horses?

No, there are two varieties—the sleeping type and the nervous or walking type.

What should be done when an animal comes down with this disease?

Place horse in well bedded box stall, put cold packs on head, and send for your veterinarian.

Will sleeping sickness affect horses this year?

No one knows. Presumably it will depend (a) as to whether the summer season is wet or dry, and (b) as to how many horses are or are not given preventive vaccination.

Does the state furnish vaccine or arrange to vaccinate horses?

No. Owners of horses should arrange individually or in groups to have vaccination applied by a veterinarian.

Can people acquire this disease?

Yes. the disease was first definitely recognized in man in the fall of 1938. It cannot, apparently, be acquired by direct contact with horses. The bite of the mosquito or other blood-sucking insects appears to be necessary in transmitting the disease.

What Makes Quality Spring Lambs?

Condensed from Sheep Breeder

L. J. Horlacher

University of Kentucky

EARLY in April, 1941, Mr. James Sharp, of Lexington, Kentucky, sold more than 300 spring lambs at fifteen and a quarter cents a pound. Since these lambs averaged about seventy-nine pounds, they returned $12 a head. They were out of western ewes, were sired by Southdown rams. All lambs were docked and castrated, and they had received some grain. Experienced sheepmen who saw the lambs the day they were sold for shipment to New York described them as being thick and blocky, thickly covered with firm flesh, the high-dressing kind that would hang up meaty carcasses.

I mention this bunch of lambs because they indicate a trend that is taking place in Kentucky sheep husbandry. Twenty-five years ago most of the ewes purchased for the production of spring lambs came from the mountain section of the state or from the southern states. These were good ewes and they helped build Kentucky's reputation for the production of quality lambs. However, due to unfavorable conditions for production their number dwindled and it became necessary to look elsewhere for replacements. The western range country seemed to be the logical place, so some of the leading lamb producers decided to give western ewes a trial. With the co-operation of the extension division of the College of Agriculture, under the direction of Mr. R. C. Miller, a few ewes were brought in and they were mostly bred to Southdown and Hampshire rams, the two popular breeds in the state. The results were gratifying and soon western ewes became quite popular. It took some time to determine just what types were best suited to Kentucky conditions and eventually it was learned that no one type was suited to all conditions or all parts of the state.

Today nearly half of the more than one million ewes in the state are western ewes. In central Kentucky, where pastures are abundant and feed is plentiful, black-faced ewes sired by Hampshire or Suffolk rams and produced in the northwest range

Reprinted by permission from the Sheep Breeder, Chicago, Illinois, May, 1941

country are quite popular. When these ewes are bred to Southdown rams they produce thick, blocky, meaty, tight-fleeced lambs that are good killers and are much in demand on the markets. These ewes are fairly prolific, are good mothers, and shear more wool than the native sheep. Other producers prefer white-faced ewes of the long-wool and fine-wool crossbred type. These ewes are large, rugged, fairly prolific, and shear very heavy fleeces when compared with native sheep. Their lambs grow rapidly and fatten well when on good pasture, but they do not have quite as much quality as lambs out of black-faced ewes. In the more rugged areas of the state where pasture and feed are not so plentiful ewes containing a large percentage of fine-wool blood do well.

The Kentucky Experiment Station under the direction of Professor W. P. Garrigus is comparing different types of western ewes for lamb production. Ten representative ewes of each of the five most common types were purchased for this work. Preliminary data indicate that the Hampshire crosses, both black-faced and mottle-faced types, produce smoother, better quality lambs than either the long-wool crosses or the Rambouillet, when bred to rams of the same breed. The light-faced crosses, however, produce somewhat heavier, more valuable fleeces. Southdown rams are being used in these experiments, though Hampshire, Cheviot, or Dorset Horn rams are used by many producers.

There has been some attempt to produce breeding ewes by mating rams of the Dorset Horn, Ryeland and Hampshire breeds to fine-wool ewes, chiefly Rambouillets. The principal difficulty encountered has been that the lambs produced are worth so much as fat lambs that they are sold as such. Ewes of these crosses when bred to medium-wool mutton rams produce good market lambs. By way of illustration, one Ryeland-Rambouillet crossbred ewe produced in the experimental flock at the University of Kentucky under the shepherding of Harold Barber in four years raised to market age six lambs and at the same time sheared sixty pounds of wool. There is profit in ewes of this kind.

Producers must continually be on guard against poor quality. In western Kentucky pounds of lambs are most important and Hampshire rams are popular. In central Kentucky quality pays, so the Southdown is very popular. However, many of the first lambs on the market are sired by Hampshires. The Cheviot, Shropshire, Dorset Horn and the Suffolk are used to a limited extent. Too much fine-wool blood in the ewes tends to result in

lambs with heavy pelts and consequent lower dressing percentage, and buyers sometimes object to this. The goal is to produce quality lambs weighing 80 pounds in 100 to 120 days and with good breeding and good pasture this can be done.

Some interesting data have just been obtained with reference to early breeding. Mr. Herschel Weil of Lexington, in cooperation with the College of Agriculture, has determined in his flock of more than 700 western blackfaced ewes that ewes that lamb early the first year are likely to continue to lamb early in succeeding years. Likewise, ewes that produce late lambs the first year are likely to continue to produce late lambs. He has also kept careful temperature records and has found that on days in August and September when the maximum temperature is high, few ewes take the ram, whereas on days with lower temperature many ewes breed.

This year's results were as follows:

	Lot 1 Ewes that lambed early in 1940	Lot 2 Ewes that lambed between lots 1 and 3 in 1940	Lot 3 Ewes that lambed late in 1940
Number of ewes	274	214	217
Date breeding began	Aug. 13, 1940	Aug. 13, 1940	Aug. 13, 1940
Date lambing began	Jan. 7, 1941	Jan. 7, 1941	Jan. 7, 1941
Number of lambs (Feb. 7)	316	186	105
Ewes still to lamb (Feb. 7)	19	83	135

Plant Ecology

W. B. McDougall

MAN could not live without plants. They are the source of all food, practically all fuel, and all important natural fibers except wool and silk which are obtained from animals that feed upon plants. They are also the direct source of rubber, paper, most drugs, and very many other products without which the progress of civilization would have been absolutely impossible. There can be no question of the desirability of studying objects that are of such very great importance to our health and comfort, indeed to our very existence, as are plants.

1. THE NECESSITY OF STUDYING PLANTS IN THE FIELD. Plants have been objects of study for a very long time. Too often, however, the studies have been confined largely to laboratories and books while field studies have been neglected.

The only practical way to become well acquainted with plants is to study them where they grow. The botanist who has limited himself largely to laboratory and library studies is usually considerably at a loss when he faces a field problem. He does not recognize the different kinds of plants nor does he know where to look for particular kinds nor why these kinds cannot be expected to grow in certain types of places. Many of the most important plant problems awaiting solution at the present time, problems that are of vital importance to the world's food supply of lumber and other forests products, are field problems. It is, therefore, essential that those who are training themselves along botanical lines should place a reasonable emphasis upon field work.

There is another reason for studying plants in the field that must receive consideration. This has to do with the esthetic value of plants. None of us would care to live in a house around which there were absolutely no plants. Whenever we think of a beautiful home or a beautiful city we think of one that is well supplied with trees, shrubs, grass and flowers. The beauty of plants in such places is greatest when their arrangements are similar to those found in Nature. Thus if we would make the best esthetic use of our plants we must study in the field the ways in which Nature makes use of the same or similar plants. A full appreciation of the beauties of Nature can be realized only by those who understand the reasons for the natural groupings of plants that are found.

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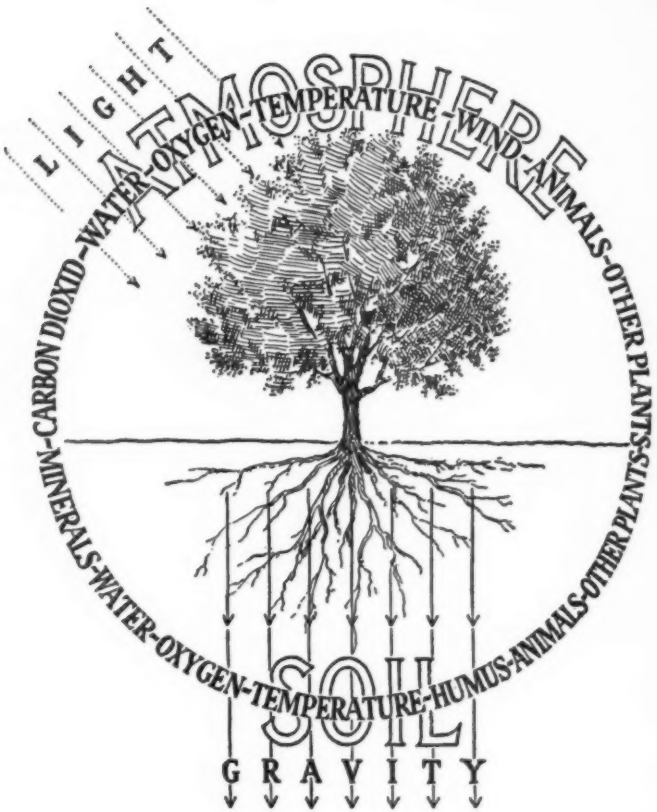

2. WHAT PLANT ECOLOGY IS. Plant ecology is the science of the interrelations of plants and their environments. It is a part of general ecology, sometimes called bio-ecology, which deals with the interrelations of all living things and their environments. It is impossible to entirely separate plant ecology from animal ecology and this book will be found to overlap into the field of animal ecology in some instances. However, as long as biological science is organized in our colleges and universities as it is at present, with separate departments of botany and zoology, it will be necessary to offer separate courses in plant ecology and animal ecology, and text-books will necessarily deal with these two branches of ecology as though they were distinct subjects.

Plant ecology is essentially a field study and this fact distinguishes it from plant morphology and plant physiology, which are essentially laboratory studies. It is also one of the most practical of the subdivisions of botany, since ecological principles form the basis of practice in agriculture and forestry as well as in many of the modern phases of conservation. The problems of the practical plant grower, or the wildlife conservationist, and those of the ecologists are similar and often identical. They are concerned always with the relations of the plant or animal to its environment.

3. THE ENVIRONMENT OF PLANTS. The environment of a plant consists of everything outside of the plant which influences in any way the life of the plant. The environment is partly living and partly non-living. The living part of the environment consists of plants and animals. The non-living part consists of numerous influences such as light, heat, air, soil and water. Each part of the environment which may exert a specific influence upon the life of the plant is spoken of as a factor of the environment or as an ecological factor.

4. AUTECOLOGY AND SYNECOLOGY. In the study of plant ecology we find it necessary to treat not only of the relations of individual plants to the environment but also of comparable relations of communities of plants. The ecology of individual plants is called autecology while the ecology of plant communities is designated synecology.

REVIEW

Instead of reprinting the usual excerpt from the book to be reviewed this month, the FARMERS DIGEST is reprinting the preface and introduction of PLANT ECOLOGY by McDougall which summarizes its contents. We feel that this introduction will give the reader a better idea of the subject matter of the book, and also show that the average person may enjoy and understand it. The book is not as technical as the title might imply.

The book will be of great value to all who struggle to grow crops, vegetables or fruit. We recommend it for the progressive farmer's library. It is published by Lea and Febiger ($3.00). Dr. W. B. McDougall, the author, is the Regional Biologist, Section on National Park Wildlife, Fish and Wildlife Service, at Santa Fe, New Mexico.

Controlling That No. 1 Hogman's Headache Contagious Abortion

Condensed from American Hampshire Herdsman

Dr. W. E. Carroll

University of Illinois

CONTAGIOUS abortion in swine is not an unconquerable disease but it is maintaining a strange hold on many herds. In some cases this is no doubt due to the breeder's mistaken belief that, after all, the disease doesn't amount to much. In other cases, breeders have a wholesome respect for the disease but are uncertain how to proceed.

Anyone who has seen the disease running rampant in a herd cannot fail to realize its seriousness. The spring farrowing record of one herd, for example, showed 21 abortions and 1 normal farrowing. Not all infected animals abort. In fact, a highly infected herd may go some time with few if any abortions, then without warning practically every sow in the herd may lose her litter. Infected sows which do not abort frequently do not settle readily when bred and may farrow one or more immature, undeveloped pigs with an otherwise normal litter.

If such trouble were all that went with a reacting herd, many breeders might gamble against them rather than go to the trouble of cleaning up their herd. Swine abortion, however, presents another hazard which cannot be measured merely in lost litters; it infects man and causes what is called undulant fever, a disease that, although not highly fatal, is extremely persistent, incapacitating and treacherous. The swine organism is much more virulent for a human being than is the cattle organism. One who handles an infected herd does not necessarily contact the disease, but the danger is present. Two swine herdsmen at one state institution were down with undulant fever at the same time and an occasional case is reported among high school and 4-H Club boys who have sow-and-litter projects.

Not nearly enough is known about the organism which causes the disease, about where and how long it will live and the various paths by which it may gain en-

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trance into uninfected animals. Until these points are cleared up, contact of any kind between infected and non-infected animals must be considered as hazardous. During a clean-up campaign at the University of Illinois, the job was almost certainly prolonged by maintaining non-reactors on lots recently occupied by reacting animals. How long a lot may remain dangerous is not known. Complete absence of hogs and one season of cultivation are believed to render a lot entirely safe.

The herd at the University of Illinois has been taken through two successful clean-up campaigns. The second experience with the disease was not undertaken purely for "experimental purposes," however this cleanup did add to our knowledge of effective control measures. In both cases, the disease was finally eliminated by frequent testing of the herd and disposal of all reacting animals. Monthly tests were originally used, but more rapid progress was made when the herd was tested every 2 weeks.

In connection with the first clean-up, an observation was made which may prove useful to breeders in making the transition from a reacting to a non-reacting herd. Eighteen of the sows that were definite reactors at that time farrowed apart from the non-reacting sows and were placed on a pasture entirely away from the swine farm. As each litter reached an age of 56 days, the pigs were weaned and a blood sample taken from each. The pigs were then placed on another area where pigs had not run and again away from the swine farm. These pigs were tested periodically during the summer and in no test, either at weaning time or later, did any of the animals prove positive to the blood test for abortion.

In late June and early July of 1939, blood samples were drawn from 85 spring pigs from 48 purebred herds widely scattered over Illinois. In spite of the fact that many of these pigs must have come from reacting herds, not a single sample showed a positive test and only three pigs later became reactors.

No guarantee can be given that results as satisfactory as these can be expected regularly. For those who are interested in developing a non-reacting herd, however, these two cases appear to point the way. If young animals at weaning time are taken entirely away from mature animals, and from old hog lots and equipment, the chances seem good that they may remain free of the disease. Tests should be made two or three times between weaning and breeding to check any failure of the procedure.

If it appears necessary to retain reacting animals because of valuable bloodlines, they should be held in strict quarantine, com-

pletely isolated from the non-reacting herd.

Studies that have been made indicate definitely that the abortion organism can live for considerable periods of time in the soil. It becomes necessary, therefore, to keep all non-reacting animals away from the area upon which reacting animals have ranged. How long this quarantine must be maintained is not known. It is supposed however, that a period of several months will be required. This quarantine must include all old hog lots and a hog-lot equipment, but equipment that can be thoroughly cleaned and disinfected should be safe. Even this, however, is a small price to pay for a clean herd.

After a herd has been finally and definitely eliminated of all reactors, it can safely exchange animals only with similarly clean herds. Even animals from clean herds, as a matter of precaution, should be retained in quarantine for a period and retested. An individual breeder who attempts alone to develop and maintain an abortion-free herd will, of course, find his way somewhat restricted, particularly his patronage of public sales. A small group of breeders working together would encounter very little inconvenience, however. As swine growers become conscious of the desirability of eliminating this disease, imagine what a help in the campaign a nucleus of clean herds would be. Furthermore, breeders who undertake to provide breeding stock for other herds owe it to their customers to give them safe animals. Without question, the public sale has been a potent factor in the distribution of the infection to many herds. Such sales if based on abortion-free animals could now be equally effective in the elimination of the disease. Progressive breeders owe this much to the industry.

Sorgo and Sudan Grass Come Back First After Sodium Chlorate

Condensed from Kansas Farmer

F. L. Timmons

Fort Hays Experiment Station

WHAT crops to grow on land treated with sodium chlorate to kill bindweed is a question that is becoming of increasing importance to farmers in Kansas. Sodium chlorate treatment has been used for bindweed control on crop land only on small patches in most cases. Nevertheless the total area of farm land in the state treated with chlorate during the last 3 years was 5,711 acres, according to the state weed supervisor. This acreage was distributed over 20,914 different farms in areas varying from a few square rods to several acres.

Chlorate-treated land should be planted to a suitable crop as soon as all bindweed plants have been eradicated, which is usually in the second or third season following the original treatment. It is important to plant the crop that will grow best in the presence of sodium chlorate in the soil in order to increase the return from the land, prevent soil erosion and, most important of all, to provide the strongest possible crop competition for bindweed seedlings that might otherwise reinfest the area as soon as the residual effect of chlorate in the soil has been reduced sufficiently.

Two experiments have been conducted at the Fort Hays Branch Experiment Station for the purpose of studying the duration of the detrimental effects of sodium chlorate in the soil and the relative tolerance of different crops to these effects. Application of sodium chlorate at rates of 2½ and 5 pounds to the square rod were made on strips of noninfested land in September, 1935, and on additional strips of land in September, 1936. Ten different crops were planted each year thereafter across the treated areas and adjoining strips of untreated land and the yields determined separately for the different treatments.

The total yields of the various crops on chlorate-treated land during the 5- and 4-year periods

of the experiments varied from 23 to 88 per cent of the total yields on untreated land. The sorghums and corn produced much more nearly normal yields on treated land than did the small grains, with the exception of oats. Surface-drilled sorgo and Sudan grass were injured less by chlorate than row crops planted with a lister, probably because the more shallow root development of the drilled crops absorbed less of the chlorate than had been leached to deeper soil levels. The rank of the different crops in order of their tolerance to the effects of chlorate in the soil was sorgo, Sudan grass, milo, corn, kafir, oats, rye, sweet clover, barley, and wheat.

Close-drilled sorgo and Sudan grass appear to be definitely superior to all other crops for planting on chlorate-treated land, not only because they produce a greater return, but also because of the vigorous competition they afford bindweed seedlings during the growing season. They are also effective in preventing soil erosion which is frequently severe on chlorate-treated land. Row sorghum is a second choice, provided cultivation after the crop is planted is thorough enough to destroy all bindweed seedlings. Oats is a fairly suitable crop where the land is plowed immediately after harvest and cultivated occasionally during the remainder of the season to destroy annual weeds and bindweed seedlings. Flax and most perennial grasses are known to be highly tolerant to the effects of sodium chlorate and might be suitable in Eastern Kansas, although it is doubtful whether they would be as satisfactory for controlling bindweed seedlings as would close-drilled sorgo or Sudan grass.

The detrimental effects of sodium chlorate on crops at Hays diminished from year to year following the treatment, but were still apparent in the yields of barley and wheat for from 3 to 5 years. On the other hand, the yields of the different sorghum crops were reduced for only 2 years following applications of 5 pounds of chlorate to the square rod, and only 1 year following applications of 2½ pounds to the square rod. The yields of sorghum forage were frequently higher on treated land than on untreated check plots the third year following the heavy application and the second year following the light application. This was probably due to the storage of moisture in the treated soil during the previous years when there was little vegetation or growth to deplete the supply.

The injurious effects of sodium chlorate persist longer in the heavier silt and clay loam soils than in lighter sandy loams. Another factor is the amount of rainfall received during the years following the treatment. The

heavier the rainfall, other things being equal, the sooner the chemical will be leached from the soil. Applications of manure to chlorate-treated land will usually reduce the crop injury from the chemical.

It should be kept in mind that if the bindweed chemical would not poison the soil for other plant growth it would not kill or poison the bindweed. No attempt should be made to bring the soil back to production until all of the bindweed has been killed on each individual infestation. The amount of land kept out of production due to chemical treatment to kill the bindweed is not considered serious when compared with the possible dangers of the bindweed which occupied the land before it was treated, or the danger of attempting to grow crops on treated land before all old bindweed plants have been eliminated.

Seven Calves in Two Years

Seven calves in 2 years and 2 months and an Advanced Registry record of 12,970.8 pounds of milk and 532.6 pounds butterfat are the accomplishments of Bay State Julie, registered Guernsey cow owned by Massachusetts State College, according to the American Guernsey Cattle Club. About 2 years ago, Julie gave birth to twins; 11 months later second twins were born; recently triplets were dropped.

Twelve Years of Cattle Experiments

Condensed from The Nebraska Farmer

FOR the past twelve years, Ray Thalman has had charge of the cattle feeding experiments at the Nebraska College of Agriculture. During this time he has found out many important facts which are of vital interest to cattle feeders in this state. On April 18, he reviewed the results of these twelve important years and summarized them for those who attended the annual Feeders' Day.

Professor Thalman pointed out that it has been apparent that the cattle feed lots will be filled, in the future, with cattle of the calf and yearling ages, and that if cattle of such ages are to be available for summer and fall marketing as fat steers, they must be purchased in the fall. This involves wintering them. In discussing the wintering of cattle Thalman said that the advantage gained by the use of cheap roughages is, of course, less when grain and hay are cheap, but even under these conditions their use is often very desirable and economical.

Under most conditions the cost per ton of ground fodder will be at least twice the cost per ton of silage to the feeder if labor in handling the crop is considered.

Alfalfa as the sole roughage is worth approximately the same per ton as ground corn fodder when the fodder is supplemented with a small amount of alfalfa.

Corn silage on a dry basis has a higher feeding value than ground corn fodder, the fodder producing 89 percent as much gain per pound of feed consumed.

Considered on the basis of gain per acre of crop, silage ranked first, ground fodder second, and shelled corn third. Further, the length of time one acre of crop will feed a given number of cattle ranked in the same order.

Weather is a very important factor in feeding ground corn fodder.

Atlas sorgo was just as palatable to cattle fed either as fodder or silage as corn similarly fed, and produced 83 percent as much gain per ton of silage fed as corn. Cut Atlas sorgo fodder made a relatively poorer feed, being worth 54 percent as much as ground corn fodder. Therefore, Atlas sorgo should be fed to cattle as silage rather than as fodder.

On yield comparisons with corn, Atlas sorgo has never failed, since its introduction here in 1929, to outyield corn. The average yield of corn for silage for ten

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years, 1931 to 1940 inclusive, is 46 percent that of Atlas sorgo. Due to the difference in yields Atlas silage has produced, over a ten-year period, an average of 58 percent more gain per acre of crop than corn. Chopped Atlas fodder produced 67 percent as much gain per acre as Atlas silage and about the same gain per acre as corn fodder. In this case, the difference in feeding value about offset the difference in yields.

Cottonseed cake produced larger gains and fatter cattle than alfalfa when used as a supplement to a silage or fodder ration. Based upon replacement values, one pound of cake was worth from 4¾ to 5 pounds of alfalfa hay as a supplement to a fodder or silage ration.

Tankage is a good supplement to a silage ration for wintering steer calves and is worth 47 percent more than cottonseed cake. Commercial cubes carrying 22 percent of protein were worth 58 percent as much as cottonseed cake.

Grainless corn silage proved very satisfactory for wintering cattle, producing approximately 84 percent as much gain and showing a replacement value of 79 percent that of normal silage.

Silage made from corn and weeds, 50-50, produced quite satisfactory gains and proved 62 percent as valuable as normal silage for wintering cattle.

Adding limestone or a high mineral carrier to a ration of silage or fodder and cottonseed cake without alfalfa hay has proved desirable by increasing the gains and decreasing the feed costs.

The wintering of heifer calves proved entirely practical. They gained 91 percent as much as steer calves and used their feed nearly as efficiently. Though they gained slightly less they came through the winter fatter, and, when placed upon full feed in the spring, made choice carcasses by midsummer. If weight does not get to be a factor in lowering price they can be marketed to advantage as late as August or September.

Yearling heifers did not prove too desirable for wintering and then feeding. While they gained nearly as much as yearling steers the problem of calving is a serious one with yearling heifers, and a long feed of this kind makes them too heavy to meet with general market approval. The yearling heifer is quite suitable, however, for making "near beef" upon limited grain rations, surpassing the steer in this respect.

Yearling steers ate 63 percent more feed than steer calves and gained 35 percent more. This left the calf with a 17 percent greater gain advantage per ton of silage consumed. The calf thus proved superior to the yearling steer for wintering upon silage and cake.

The yearling was, however, fatter in the spring and could then be gotten ready for an earlier market, even midsummer.

Where it is the object to produce as much beef as possible on heifer calves with a maximum of rough feed such as silage and a minimum of grain concentrates, the feeding of two pounds of cottonseed cake, per head daily, results in greater profits than feeding one pound. Also, one pound of cake and three pounds of molasses daily, with silage, results in greater profits than one pound of cake. Three pounds of molasses plus one pound of cake proves equal in net return to two pounds of cake, making the additional pound of cake equal to 3 pounds of molasses. Six pounds of molasses and one of cake are worth less than 2 pounds of cake or one cake and 3 of molasses. Three pounds of corn plus 3 pounds of molasses are worth considerably more than 6 pounds of molasses and would be justified even though corn cost 75 percent more than molasses.

2 cake = 1 cake + 3 molasses
2 cake = 1 cake + 6 molasses (or more)
3 of molasses + 3 corn = considerably more than 6 molasses and slightly more than 2 cake

Processing of feeds for fattening cattle is important. Thalman said that perhaps no other problem regarding feed processing is more troublesome than that question—does it pay to grind corn for cattle? Reviewing the literature on the subject and summarizing many tests at this station still leaves me somewhat in doubt, he said. There were some rather persistent occurrences in these trials, however, about which there is no doubt.

Cracking the corn increased the gains slightly in three out of five experiments but in only one out of 5 cases did it result in increased economy. In the five trials reported, the value of the sale cattle fed cracked corn averaged 11 cents per hundred more, but they needed to sell for 23 cents more.

Pork production by hogs following the cattle getting cracked corn averaged slightly under 50 percent as much as those hogs following cattle fed whole corn (one pound of pork against .44 pound of pork for each bushel of corn consumed by the cattle).

There is no question but that grinding pays with the sorghum grains. Cracking the grain increases its value from 22 to 25 percent.

Feeding ground ear or ground snapped corn saves some hay, but lengthens the feeding period and adds to the cost of gain, especially with the younger cattle. Pork production in the lots fed ground ear or snapped corn averages approximately 60 percent that in lots fed shelled corn.

Every feeder is interested in

corn and alfalfa substitutes. Thalman pointed out that the problem of limited grain rations for fattening cattle is a difficult one to summarize in a statement or two, since there are so many different factors to be considered. It is a problem usually limited to relatively short periods when the price of grain gets out of line with the price of cattle.

Generally speaking, limited corn and alfalfa rations, when fed to steers, have not proven especially profitable. Where silage is the sole roughage, limited grain rations with big steers and yearling heifers have been quite satisfactory. Calves, either heifers or steers, if they are to be fed on limited grain rations, should be handled over relatively long periods and silage should be the principal roughage used under Nebraska conditions.

When molasses is used to replace corn its value depends to a large extent upon the amount of molasses fed. Used to replace all of the corn, its replacement value was 66 percent, or ⅔ that of corn. Since it produced thinner cattle that sold for less money, even this value is high. When molasses and corn were used, half and half, the value of molasses was approximately 84 percent that of corn. Used to make up about ⅓ of the grain ration, molasses had a value of 90 percent, and when fed in quantities not exceeding 15 percent of the grain ration, it was equal to corn pound for pound.

Molasses has no apparent detrimental effect upon the beef, producing just as white and attractive carcasses as corn.

Hydrol, or corn molasses, proved definitely less palatable than cane molasses but, because of its higher sugar content, was worth from 10 to 15 percent more per pound.

In three different experiments there was no apparent advantage in adding alfalfa molasses meal to a shelled corn and alfalfa hay ration.

Wheat, when fed in quantities not exceeding ⅓ of the grain ration was just as valuable as corn for fattening cattle. Fed in larger amounts, even as the sole grain, wheat proved quite satisfactory from a gain and finish standpoint but it proved difficult to feed. It should be cracked for best results.

Ground oats fed in quantities not exceeding 10 to 15 percent of the grain ration have proved nearly as valuable as corn per pound, but as the sole grain, oats are worth approximately 60 per cent as much as corn for fattening cattle.

Hominy proved only slightly less valuable than corn.

Wheat straw can be used to advantage as a part or even all of the roughage for fattening cattle when alfalfa hay is high in price and the value of protein

supplements is not more than 2½ times the value of alfalfa per ton.

Whether to feed on dry lot or on pasture, according to Thalman, is another important problem. He found that in each of three trials comparing dry lot and pasture feeding, those cattle sold directly off of pasture sold for less money than those fed in and sold out of dry lot. Steers fed on Sudan grass pasture also sold higher than those fed on sweet clover pasture. Differences in gain between cattle fed on pasture and in dry lot were insignificant, indicating that cattle on grass grow more and fatten less than those fed in dry lot, which means that pasture feeding should be followed by a minimum of 30 days feeding in dry lot.

In each of three trials in which yearling steers were fed cracked corn on permanent pasture the pasture-fed steers gained slightly more than similar steers fed in dry lot. One acre of pasture saved on the average the equivalent of 711 pounds of corn (12.7 bushels) and 933 pounds (½ ton) of alfalfa hay. The dry lot-fed steers averaged 17 cents per hundred more in sale value even though a dry lot period of from 3 to 6 weeks was given the pasture-fed steers following the grass season.

When half-fat steers were fed on pasture their gains were equal to similar steers continued on feed in dry lot, but the economy of feed utilization was greater among the dry-lot cattle. It thus did not make pasture worth a great deal to feed out half-fat steers on grass.

No significant difference in value was found between whole corn, cracked corn, or ground ear corn, for fattening steers on pasture.

Considering time necessary to make choice beef, the yearling heifer produced beef as economically when fed corn on pasture as the yearling steer. The steer required a feeding period longer than was economical for the heifer. Both yearling steers and heifers gained more efficiently than two-year-old steers when fed grain on grass. The feeding period necessary for the two-year old steer was the same as for the yearling heifer.

During the past several years several different protein supplements have been developed. Thalman found that an addition of protein supplement to a shelled corn and alfalfa ration always increased the gain (8 to 11 percent) and resulted in a higher sale value, which averaged approximately 20 cents per hundred. This made supplement feeding profitable so long as it did not cost more than from 2 to 2½ times as much as corn. Contrary to expectations, older cattle responded to supplementary feeding better than calves when the

animals received from 1½ to 2½ pounds of supplement per head daily.

Supplementary feeding proved significantly more valuable when the ration contained silage in addition to corn and alfalfa. In this case one is justified in paying from two to three times as much for the supplement as for corn.

Compared over a period of years, linseed oil meal tended to increase the sale value slightly more than cottonseed meal, but it did not increase the gains quite as much as cottonseed resulting in very little difference, if any, in final value of the two supplements.

Tankage proved a better supplement for wintering cattle than for fattening cattle, but it proved quite satisfactory in either case. Three-fourths of a pound of tankage proved equal to one pound of cottonseed meal. Dry rendered tankage is better for cattle than wet rendered (digester) tankage.

Thirty-seven percent protein cubes proved 93 percent as valuable as cottonseed meal and 22 percent protein cubes 58 percent as valuable as cottonseed cake.

Grain sorghums have become an important feed in Nebraska, because drouth years have cut the corn supply. Thalman stated that grain sorghums, when ground, have given very satisfactory results as substitutes for corn in the ration for fattening cattle. White kafir was worth 87 percent, Early kalo and Day milo 91 percent, Sooner milo and Atlas sorgo 96 percent as much as corn.

The grain sorghums fed slightly easier with silage than with alfalfa hay, but in neither case was trouble ever encountered. There seemed to be less tendency for cattle to scour when fed sorghum grain than when fed corn.

Ground sorghum heads prove entirely satisfactory when fed during the first half of the feeding period, at which time a gradual change to ground threshed grain should be made for greatest efficiency.

The grains tested have produced beef just as attractive as corn, both as regards color and texture of both fat and lean.

Getting Ahead in the Farming Business

N. Miles

WE are all agreed that the successful management of a farm is not as simple as it used to be. Changes in methods, markets, care of the soil, livestock production, roads, communication, transportation and living conditions have combined to make farming a business in which an operator is rewarded in proportion to his efficiency. Today the successful farmer must keep abreast of scientific discovery and adapt to the improvement of his own enterprise the experimental results of the laboratory and the broad experience of his fellows.

Along with the changed practices for raising improved crops and producing livestock more efficiently have come alterations in farm economy which affect the management of the cash that reaches the farmer's pocket. The amount of money handled by the average farmer has remained small in comparison to the investment involved in the business. Nevertheless the calls for the outlay of cash have increased in many directions.

The automobile provides an example. This convenience of modern life has broadened the horizon of every farm family. Yet its purchase represents a substantial investment and every time it goes on the road the pennies trickle away. Beyond the cost of its operation, the automobile carries its owner and his family to places where money can be spent for other purposes—some necessary and desirable—others not. No one would go back to the horse and buggy days, but the fact remains that our modern life has increased the demands upon the farmer's store of cash.

The successful management of available funds is therefore of great importance if financial progress is to be made.

The principles governing the use of income in business are simple, but they are not always easy to follow.

The first necessity is to keep the outgo within the income. We all know that nobody can spend more than he makes without coming to grief sooner or later. In order to make progress, to reduce debts or to save money for any purpose, there must be a margin between the amount taken in and the total paid out.

When I was a youngster my father one day called my attention to this homely truth. "I tell you, son," he remarked, "it

doesn't make so much difference what a man takes in, it's what he keeps that counts."

It is of course desirable to produce as large an income as possible. If income is low it can often be improved by increased efficiency resulting from the employment of better practices. The farmer who sees to it that his hogs are raised under sanitary conditions is certain to have better results than one who allows his pigs to become infected with worms and disease. Each improved practice followed will help toward increasing income to the highest possible level.

But whatever the income obtained, its disbursement must be controlled in order to finish with something left in hand when the year rolls around. A record of income and outgo is a valuable aid to this end. Too many otherwise good and industrious farmers find themselves at the end of a year's operations without accurate knowledge of where they stand. Their money is gone, but where it went they cannot tell. A little bookkeeping will supply this valuable information. The record need not be complicated, nor its keeping burdensome. A simple account of what is taken in from each source and for what the money is spent will enable any farmer to determine where his funds came from, how much he received, and what each class of expenditure amounted to.

The record may show that too large a share of the income is going for a purpose that can be curtailed. It is worth while to discover such leaks.

In addition to the cash account of receipts and payments, an inventory of both assets and liabilities at the end of each year enables the farmer to know whether he has made progress over the period for which the record is kept. If at the end of the year he has more stuff around him and less debts than at the beginning, he knows that he is better off than he was. Every operator has some idea about his position, but an actual listing of his assets and liabilities provides the basis for correct comparisons.

There are available excellent farm account books devised by the agricultural colleges, which cover both the cash transactions and the inventory. They are simple, complete and, if faithfully kept, present a true picture of the operating results. Whether or not such a system is used, the records of cash receipts and disbursements and the annual inventory, reward each farmer who keeps them with an accurate knowledge of his business which can be gained in no other way.

With the record of the past as a guide, intelligent plans for next season can be more readily formed. On the basis of his previous recorded experience the farm operator can make a reason-

ably good estimate of what his income is likely to be, how much of it will go for the necessary expenses of living and farm operations, and what he may have to spend for other purposes and to keep as savings. Such a budget plan is of course subject to adjustment with varying seasons and price ranges, but a plan that may have to be changed is better than no plan at all.

When savings from operations have been established it is highly desirable to build up a reserve for emergencies. Ready cash provides a protection well worth saving for. Marketable assets of any kind in excess of operating necessities afford a means of raising money when unusual need or opportunity arises. Many a farmer has been glad that he had a crib of old corn on his place, when somebody had to go to the hospital, or when he saw a chance to buy some feeders worth the money. The loan value of a life insurance policy has often proved an important asset when the pinch came. A reserve of some character is both a protection and a means of progress.

Farming is founded on the faith that the rain will fall, that the sun will shine, and that seed put into the ground will grow and produce a harvest. Some times these forces of nature fail. Such chances must be taken. Yet the business is essentially conservative, and unnecessary risks should be avoided. The steady plugger wins more often than the plunger. A feeder, who has successfully handled a load or two of cattle each year, may win if he doubles or trebles the number of cattle in his yards, but he will be safer to expand more gradually.

Nearly all of us have to use our credit to keep the wheels turning. Some of us have had the hard experience of being caught with too many debts, when income was suddenly curtailed. The wreckage of the mortgages made when land was high in price has not yet been cleared away.

The lesson from all of this is plain. Credit is a valuable aid to business when employed on a safe basis, but its use can be ruinous if overdone. It is an instrument to be used with caution.

To sum up these foundation principles, we may be pretty sure of ourselves if we successfully observe the following rules:

1. Keep outgo within income.
2. Improve income by better farming.
3. Control outgo by keeping records and planning expenditures.
4. Establish a reserve.
5. Avoid taking unwarranted chances.
6. Use credit on a safe basis.

The farmer who charts his course by the light of these six business principles can hardly fail to make progress from year to year.

Better Pullets at Less Cost on Good Range

Condensed from Everybodys Poultry Magazine

Roland C. Hartman

ONE way to cut pullet rearing costs is to get the birds to eat more tender, green grass while on range. Some authorities claim that the savings on feed as a result of growing the young stock on a good, green range may amount to as much as 25 per cent.

Walter Shaw, who operates the 40-acre, 2,500-bird Inglenook Poultry Farm in Delaware County, Pa., won't claim that his savings on feed during the rearing period are that much, but he figures that he has reduced his feed bill appreciably by growing his pullets on Ladino clover range. And both he and his son, Phillip, are agreed that the pullets which they housed last year were as fine as they could desire from a standpoint of health and vigor.

For a long time, the Shaws followed a 4-year rotation scheme which included sweet corn, wheat and alfalfa. The alfalfa would be used for range as soon as a good stand was developed.

The trouble with alfalfa was that it killed out easily in winter. This happened, too, with frequent cutting. As a green feed, it wasn't particularly relished by the birds, for there is something about it that they didn't like. It became woody as the season progressed, despite the cuttings at regular intervals.

Having heard about the good pasture qualities of Ladino clover, the Shaws decided to try it. On August 20, 1939, they sowed a field to the following mixture:

5 lbs. Timothy
12 lbs. Kentucky Blue Grass
5 lbs. Domestic Rye Grass
3 lbs. Alsike Clover
1 lb. Ladino Clover

The purpose in planting this mixture was to obtain a mixed sod. The Alsike clover was only temporary, and the rye grass served as protection through the first winter. Actual cost of the seed was $5.50 per acre.

Prior to seeding, 20 per cent superphosphate was applied at the rate of 600 pounds to the acre. Walter Shaw emphasizes the importance of fertilizer in getting a good start on range grasses. The soil should be limed in accordance with its needs. Clovers need lime in order to thrive.

By winter, the rye grass reached a height of 6 inches and formed a good protective cover for

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the other grasses and the clover. The rye, of course, killed out that winter.

When the first lot of pullets was placed out on range on May 1, 1940, the grass was cut because it was 8 inches high. The mower was set to cut 2½ to 3 inches high. During 1940, the range was cut eight times. Here are the dates and the height of the growth at cutting time:

May 1 .....8 inches
May 20 .....8 inches
June 5 .....8 inches
June 25 .....7 inches
July 20 .....5 inches
Aug. 20 .....5 inches
Sept. 15 .....5 inches

The eighth cutting was spread over several weeks from the middle of September until Ocober 17. The growth wasn't high at that time and it could be handled with a lawn mower. Only small sections were mowed at a time. These clippings were carried to the laying hens.

The idea behind the frequent cutting, as Phillip Shaw explained, is to maintain a tender green growth all through the season. If the growth is allowed to get much beyond 8 inches, it loses its succulence and the birds eat less of it. Not only that, but its feeding value from the standpoint of vitamin and mineral content is decreased as the growth gets to the fibrous stage.

While Ladino clover comprised only a small part of the original seed mixture, it and Kentucky Blue Grass form the basis of the present range. They make a good team. As a legume, Ladino stores up nitrogen which is used to advantage by the blue grass. Both grow better than they do alone. During the dry period, such as occurred in July, the blue grass was virtually dormant, while the Ladino clover continued to furnish tender, succulent growth.

Ladino clover is particularly good as a green feed for poultry. It has a leafy luxuriant growth and the stems are fine and juicy. The stems grow rather close to the ground, so that the leafy growth extends up. It loses none of its succulence later in the season as long as it is clipped at intervals. The birds really go after it.

Whereas alfalfa kills out rather easily in winter and from continued cutting and grazing, Ladino seems to stand up well. The Shaws do not move their range shelters during the rearing period, and the only place that the growth killed out was an area 2 to 3 feet around the shelter. The feed hoppers are moved several times each week. There was no evidence of winter killing when I walked over a patch of the range the middle of March.

How long will a Ladino clover range last? That is hard to tell. But not so very far away from the Shaws is a dairy farm which has had a Ladino pasture for five

years with as many cuttings as seven times a year. There are no signs that it is giving out.

Since their range lacks sufficient shade, the Shaws intend to plant sunflowers in patches about 20 to 30 feet wide. They attempted to do this last year, but the young stock cleaned out the sunflowers before they had a good start. This year, the sunflower strips will be fenced for protection.

Under the feeding program followed last year, the range stock was given mash in the morning, just what they would clean up in an hour or less. Grain was kept before the birds in hoppers all the time. A hopper of oats was kept inside each shelter.

To anyone wishing to establish a Ladino clover range under conditions similar to those existing in southeastern Pennsylvania, Walter Shaw would offer the following suggestions:

1. Seed the range the middle of August, no later.

2. Be sure to apply fertilizer. This is essential in obtaining a good stand.

3. Lime the soil. Check with the county agent on the lime requirements of your particular soil.

4. Don't let the clover get higher than 8 inches. Clip it to 2½ to 3 inches in order that there will be a succulent, tender growth all through the season.

Lights Make Early Broilers

Many poultrymen have used lights to their profit with layers, but F. B. Winfrey, Carroll county, Missouri, has found they are equally beneficial for broilers. Feeders and waterers were filled at night and the lights automatically turned on at 1 o'clock in the morning. By daylight the feeders were empty. This extra consumption of feed speeded up growth so much that they reached the 2½-pound point at 11 weeks.

—*Missouri Ruralist*

Making Soybean Hay

Condensed from The Michigan Farmer

I. J. Mathews

CLASSIFYING soybeans as a soil conserving crop WHEN CUT FOR HAY makes the time of cutting and better methods of curing and storing of unusual interest. Collecting the scraps of scientific evidence from investigations far and near coupled with farm experiences may help many livestock men to more safely store more nutritious soybean hay in their mows and feed it next winter with little waste.

Late cut soybean hay is most nutritious for dairy cows. We can divide soybean hay into early-cut (flowers in full bloom); intermediate-cut (beans just forming in the pods) and late-cut hay (beans three-fourths formed in the pods). A great deal of animal food is stored in the plant during the time between bloom and the time when the beans are three-fourths formed. Analyses show that during this time the crude protein increases more than one percent.

Three years of dairy feeding experiments at Purdue show late cut soybean hay producing 14 per cent more milk and 20 per cent more butterfat than intermediate or early-cut hay. These results suggest that farmers seeding soybeans before their corn so the hay can be cut in late August or early September understand these late additions of nutrients and seed the crop so they can cut prime quality hay when fast curing weather is the rule.

Late-cut soybean hay is more valuable too, for the beef cattle feeder. In an experiment at the Kentucky experiment station involving 10 steers in each of 2 lots followed by 10 pigs, the lot fed early-cut soybean hay gained 145 pounds while the lot getting late-cut soybean hay gained 170 pounds.

How best to cut, cure and store soybean hay at the proper stage is the problem. Some merely cut it with the mower, rake up the tangled mass when dry and put it into cocks. So piled, it cures out very slowly.

Dick Ulken, a careful dairyman of Elkhart County, Indiana, follows a method that requires more hand labor but results in nutritious hay of a higher carotene content. His men fork each swath into small piles while the plants are still tough enough to retain their leaves. The next day

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they fork 2 of these small piles together and 2 days later, if good drying weather has prevailed, 2 of these piles are put together, which means that in 5 or 6 days, barring rain, the hay is ready to store.

Another excellent method is to bind the beans into bundles and set these up in "A"-shaped shocks of 10 or 12 bundles. This allows some circulation of air under the bundles and causes much of the stem and leaf moisture to evaporate out of direct sunlight, thus saving more of the hay's carotene content. Outside of the difficulty of curing, the biggest objections to soybean hay are the immense bulk that it occupies in the mow and the coarse stem refuse.

This waste depends upon several factors—how thickly the beans were planted, how fast they grew and how mature they were when cut. With big plants where someone tried to save on seed, the refuse may run as high as 50 per cent. The pity is that all this refuse has to be handled just as many times by hand or otherwise as though it were edible.

The Wisconsin station reported one feeding trial where 18.6% of soybean hay was refused. The Maryland experiment station reported a soybean hay feeding trial in which 29.2% of the total weight was refused; from 30 to 50% of the soybean hay that is put into livestock mangers is later thrown out as poor bedding.

This loss is eliminated by uniformly cutting, recutting and blowing the hay into storage. Where this procedure is followed, bundle hay goes through the roughage mill faster and is easy to feed. If the soybean hay is loose, it should be pitched right at the finger feed.

Generally, it is better to lay the feed delivery pipe on the mow floor, blowing the hay against some smooth backstop. Change the feed distributor every load. This keeps the cutting uniformly well distributed in a shallow pile, not over 8 foot deep to cure with little likelihood of overheating. Those who use a roughage mill with a grain separator often sack and save the beans or grind them up with corn to make a dairy or beef concentrate. Others separate and grind the beans, letting them flow back into the stream of chopped soybean hay.

Where soybeans are used extensively for hay, one may be up against it to either provide more storage space, put them into the silo or store as chopped hay. Generally, chopping costs less. At least 3 times the tonnage of chopped soybean hay can be stored in the space occupied by an equal weight of long hay.

Where the hay is cut in bundles late in fall, frequently both soybeans and cured corn fodder may be chopped and blown into the mow together, thus storing

a mixed roughage high in protein content.

On the Ike Bryant farm in northwestern Indiana, a load of cured soybean hay bundles and a load of corn fodder bundles are drawn up on either side of the feed table and thrown in alternately, making a nutritious blend in the mow.

Contour Lines Laid Out by One Man

Condensed from Missouri Ruralist

A simple easy system of laying out contour lines for contour farming is being used by Jay Davis, who farms with his father, W. C. Davis, near Marshall. The plan is a one-man system, and Jay laid out his first line, a quarter of a mile long, in 30 minutes.

The plan was illustrated at the Saline County Soils and Crops Conference this spring. When Jay Davis called at the county agent's office to see whether he could borrow the Farm Bureau tripod level, it was in use, so Henry Hamilton urged Davis to try the new method.

He tried the one-man system, liked it, and now is contouring all the cultivated acres on the 240-acre farm with it.

All the equipment needed is a bunch of laths sharpened on one end, and all painted to exactly the same height—about 4 inches—on the sharpened end, and a hand level.

One lath is driven down as far as it is painted, at approximately the place where you want to begin the contour line. Then move across the hill 100 feet. Turn a lath upside down, and place the hand level at the bottom of the painted portion. Looking thru the hand level, a small bubble will tell you when you have the instrument level. Then by looking thru the level across the field at the first lath set, you can tell whether your second stake is above or below the level of the first by cross-lines in the hand level sight. By moving your second stake up or down the hill you can get it almost exactly on a level with the first. When the spot is found, turn the stake over and drive the sharpened end into the ground as far as it is painted. Proceed to the next stake.

It may sound complicated, but it really is pretty easy. A man can lay out a rather long contour line in less than 20 minutes.

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Corn Cob Pipes

Condensed from Nation's Business

James McQueeny

OUT of John Kraft's 80 acres of rich, Missouri River bottom-lands comes the raw material for making thousands of corn cob pipes. And, as is true of scores of other Central Missouri farmers, John Kraft sells his cobs first, then the corn, thus finding a lucrative market for a product which is almost a total waste on most farms.

The cob pipe belongs to that select little group of favorites, the apple pie, blue serge suits, Currier & Ives prints, Johann Strauss' waltzes, and the circus whose popularity never seems to diminish. The pipe-makers say their product leads a double life —for every one that's smoked in public five are tucked away in office drawers, by easy chairs in dens, and on window sills above basement work benches.

The South African Kaffir, the gaucho of the Argentine, the Calcutta dock worker—they're all acquainted with the cob pipe and, despite depressions and droughts, wars and plagues, more than 30,000,000 are sold all over the world yearly. To meet this demand, approximately 20,000 acres of special corn are grown in Missouri for the four factories which control a world market and are within a few hours' driving distance of one another.

If you tried to bore a hole in an ordinary cob it would fly to pieces, hence the need for special ones grown from Collier seed, a cross of native Indian and Boone County white corn, which thrives in the river bottom lands.

E. H. Otto, president of a large cob factory at Washington, Mo., gave me an insight into this topsy-turvy bit of farming. In the early spring, he pointed out, his organization supplies seed at $2.00 a bushel, for a farmer with a patch of ground suitable for growing the hardy, late maturing strain, though no payment is made until the crop is harvested and the cobs tabulated. All cobs measuring one and three-quarters inches or more in diameter are bought from the grower at a fixed price, usually around a half cent each, though in poor years it jumps to a cent and a half per cob.

The larger the cob, the more woody the fiber, an all important factor in making quality pipes. Unusually large cobs bring a premium, the largest one ever offered a pipe maker being almost 13

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inches long, approximately six and a half inches in diameter, and weighing a full pound.

On a normal yield, a farmer realizes $10 to $15 an acre on his cobs but in banner years the return may scale up to $20. There's no extra expense involved. The company delivers the seed to his door-step and, when his crop is gathered and shelled, a truck stops by to pick up the cobs. The turnover among cob producers is small and, in his ledger, Mr. Otto showed us the names of several farmers with whom he had been doing business 40 and 50 years.

It's not unusual for the factory to have between $50,000 and $60,000 tied up in cobs during a single season. Once the cobs are deposited at the factory they must be seasoned for a year or two so they'll absorb the nicotine satisfactorily; the early winter months often find more than 1,000,000 cobs in the freely vented storage bins adjoining a factory.

Making a cob pipe is exacting work, and without mass production methods, their price would be prohibitive.

Depending on the style of the model, between 13 and 17 hand operations are involved. As soon as the nubbins have been culled and burned from a seasoned batch, a sawer rips the remainder into pipe lengths and throws away the waste.

Surprisingly enough, properly aged cobs are tougher than most hardwoods and the wood turner handling them must take every precaution not to burn his tools. The bowls are machine bored and, after being placed on spindles, are filled with plaster to plug the pores. The white sanders, as one group of workers are called, polish off the roughness before the first coat of shellac is applied. Tops and bottoms are then polished, the stems fitted, and varnish applied.

Formerly, the stems of a large percentage of corn cob pipes were made from Weishel wood—a stunted, non-bearing cherry tree found in Austria—but European developments have so complicated its importation that synthetic plastics and woods more readily obtainable are now being used.

Begun in 1869, the plant Mr. Otto directs has facilities for turning out 20,000 pipes a day in various styles.

A few years ago, R. M. Strutz, third generation president of his family's pipe factory at Boonville, Mo., began casting about for ways to increase sales. After talks with pipe smokers, dealers, and jobbers all over the country he concluded that his market could be improved by dolling up his product. Many pipe devotees thought it too crude and undignified for every-day use.

E. J. Steuterman, a technical

engineer, was handed the assignment and within a short time evolved a coated model embodying the comforts of the cob smoke and the appearance of a briar. Another innovation that's had a vitalizing effect on sales has been an underslung model with a detachable filler, which can be changed periodically. Still another style that's been gathering sales momentum within recent months has been a medium-sized untreated cob pipe retailing for a nickel.

Dropping Boards or Pits?

Condensed from The Poultry Item

C. E. Lee

CONTRARY to common impression, dropping *pits* in poultry houses are not new but are a very old type of construction. It is the dropping *board* that is a relatively new and modern development.

We have no data as to what the early Egyptians may have done but several of the old Roman writers on agriculture mention the use of "pits under the roosts in the fowl houses to catch the night droppings." No mention whatever is made of dropping boards by any of these early writers; in fact, the first mention of dropping boards we can find is by certain English writers in the time of Queen Victoria.

At any rate, it seems that dropping pits certainly were in use many hundreds of years before dropping boards were ever thought of and the question naturally arises as to why people ever did develop dropping boards, rather than improving the pit idea. As a matter of fact, within the lifetime of this writer there has been a rise in popularity of the pits in at least three different sections, and subsequent declines. I well remember as a boy that a relative who carried a large laying flock on his farm got the idea of the dropping pit, removed the dropping boards and installed pits throughout. This lasted about two years, and then the whole thing was ripped out and he went back to dropping boards.

In this case the difficulty was that the manure rotted the wooden floor of the house and also the back walls, gave off a considerable stench which certainly was not pleasant or beneficial to the birds on the perches at night, and also became a harboring place for red mites in such numbers as to threaten to wipe out the flock eventually.

That was about 1910. We saw nothing of pits after that until a certain poultryman on Long Island, carrying a large number of White Leghorn layers, tried the idea about 1923, along with two or three others on the Island. We remembered particularly the results in this particular house. The floor, being of concrete, of course did not rot, but the rear wall of the house rotted and red mites multiplied in large numbers. There were ammonia fumes altogether too thick and, as in the earlier instance in Connecticut,

Reprinted from The Poultry Item, Sellersville, Penna., Dec., 1940

colds among the flock seemed to be much more frequent and serious.

Recently, one poultry authority has again introduced the idea of pits and has promoted it so effectively that it has spread quite widely here in the northeastern states. Whether it will disappear and again give way to dropping boards as has happened time after time in the past, or whether the method of construction and management of pits will be so improved that the disadvantages may be overcome, we cannot tell at this writing but we feel certain from talking with many poultrymen who have either constructed pits or intend to construct them in their laying houses, that they are not at all familiar with the disadvantages of pits and it seems highly desirable that poultrymen understand that pits do have decided disadvantages.

The usual arguments given in favor of dropping pits are that the pits save labor, that they are easier and less expensive to build, that litter remains clean much longer, that there is less trouble from broken egg yolks in the body cavity and from bumblefoot, and that pits are an aid to pullets just learning to roost.

As a matter of fact, all these arguments are open to dispute and the personal opinion of the writer is that pits are being installed by many poultrymen simply because they are different from the dropping boards previously used in recent years and poultrymen believe that they represent progress. They should stop and consider that the Romans were using pits and that they have been used by many other people since then. Dropping boards were probably evolved by a poultryman who wanted a more sanitary and healthful poultry house than he was able to secure with pits and, it would seem that this idea still deserves some consideration.

Do Pits Save Labor?

We may consider first the matter of labor. We know that a certain number of birds are going to deposit a certain number of pounds of droppings per night and that it is going to take about so much labor to remove that from the poultry house regardless of how we do it. Is it actually going to save labor to let this manure accumulate in a pit until it has more or less solidified and perhaps frozen solid, and then try to break it up and remove it in chunks, or is it easier to scrape a light accumulation off the dropping boards two or three times a week?

One of the unsolved questions that we would like to have someone answer is what should be done with these great chunks of poultry manure that are taken out when the accumulation in pits is broken up during the winter? Of course, this is no problem

where the temperature never gets down to freezing inside the poultry house but, such poultry houses, particularly in northern New York and New England, are hard to find. One poultryman told us last spring that he had no trouble of this kind because he never cleaned out the pits during the winter and, at that time there appeared to be about 30 inches of manure accumulated in pits in one of his laying houses which we visited. As a matter of fact, the manure was just about up to the wire over the top of the pit and it seemed likely that very shortly the birds would be walking on manure if they had to step down or up to the roosts. This poultryman, when asked how he would clean the manure out, stated that he probably would have to wait until it thawed out in good shape along about the 4th of July. The air in that particular house was already very bad and his birds were suffering from a respiratory trouble. Whether or not the pits had anything to do with respiratory infection, they certainly didn't help the resistance of those birds.

After we got back to the Research Farm and looked at the boys scraping the dropping boards into a litter carrier, we decided that this idea of saving any labor by letting manure accumulate in a pit over a long period was certainly an illusion. Even in the houses where we don't have the litter carrier, but park a wagon at the front of the house and move it along from pen to pen as we clean the dropping boards, we think that it is a far easier task than to attempt to excavate one of these pits after it gets well filled, and certainly a lot pleasanter job, too.

We will admit that we use 22-gauge galvanized sheet metal on wooden frames for dropping boards and that there is a lap of the metal sheets only every six feet, so that we do have an unusually easy dropping board to clean. In freezing weather, a few handfuls of litter scattered over the dropping board after it is cleaned will prevent any manure freezing on to the metal.

Advocates of the pit system claim some saving in cost of construction, but we have never seen any figures to demonstrate that this is so or how much the saving may be. The roosts have to be built anyway and if a deep pit is made, the lumber used may approximate the amount which would be used for dropping boards. The wire over the top of the pit is a constant factor under both types of construction, as wire should be put under the perches anyway. We do not think that the small difference between the cost of the pit construction and the dropping board system, if there is a real difference, amounts to enough under any ordinary conditions to be

seriously considered when making the large investment necessary in constructing a good sized commercial laying house, particularly in view of the fact that the saving will depend on how large the pit is made. If it is large enough the amount of lumber used may considerably offset any possible saving.

It must also be taken into consideration that unless there is a lining of concrete or sheet metal, or unless all parts touched by the accumulated droppings are thoroughly soaked in oil or some Creosote compound, the rotting which will inevitably take place may not only offset any original saving but may go far beyond that.

Saving in Litter

The only saving that can result in the amount of litter needed, of course, must be due to birds depositing a greater percentage of droppings in the pits than would be the case with the regular dropping board construction. Anyone who has seen both systems in use will admit right away that the birds use the roosts over the low pits more than would be the case with roosts over the higher dropping boards. If the pits and the dropping boards were the same height, resulting in roosts being the same height from the floor, we can't see why there should be any difference.

It seems evident that most of us have probably constructed dropping boards too high above the floor. However, there is another factor here. Birds can use the floor space under a dropping board to good advantage but they don't use the space covered by the dropping pits except as they sit above them. Personally, we would much prefer to have our birds busily working in the litter on the floor underneath the dropping board than to have them sitting above a dropping pit and doing nothing, except perhaps inhaling ammonia fumes.

The very presence of the pit reduces the usable area of the pen and that is undoubtedly one of the reasons why you will find more birds on the perches where droppings pits are used than is the case when the usual dropping boards are provided. The birds feel more crowded and consequently they go up on the roosts, where if they had the full floor space they might be down working in the litter.

Pits prevent trouble with internal laying and bumblefoot. This, of course, is true providing you compare low roosts over a low pit with much higher roosts above a dropping board that is higher from the floor than the top of a pit would be. Pits are of all kinds, sizes and shapes. We have seen some over 30 inches high, and we have seen some only 8 or 10 inches high, so it is hard to make statements which apply

equally to all pit construction. But our answer to this argument would be simply that we must give more thought to lowering our roosts. Undoubtedly, a large percentage of poultry houses in the past have been equipped with roosts and dropping boards that were much too high above the floor.

Pits with low roosts have served a useful purpose in calling our attention to our error. Now, there is no reason why we shouldn't go ahead and construct dropping boards and roosts that are nearer the floor, as they should be, and still allow usable space for the birds to work in, underneath the dropping boards.

Pits Help in Teaching Pullets to Roost

The poultryman who raises Leghorns can dismiss this argument without further consideration.

The poultryman keeping heavy breeds should not have any real problem in getting pullets to roost where the usual dropping boards and roosts are provided, if he has used roosts of the proper construction in his brooder houses and his range shelters so that the birds are accustomed to roosting before coming to the laying house. If his roosts and dropping boards are as low as they should be, the birds will go to roost on them just as rapidly as on any pit and roost construction that could be designed for practical use. We have housed 2,000 to 2,500 pullets a year every year at the Research Farm and we have never had any serious difficulty in getting the birds to roost in spite of the fact that we have always raised fully as many heavy birds as Leghorns.

Using Phosphate May Help

Anyone familiar with the short life cycles of flies and the tremendous multiplication of flies in accumulating manure, also in the prevalence of tapeworm infection, and the function of the fly as an intermediate host to tapeworms, must realize that the accumulation of manure in pits is a decided menace from the standpoint of fly control and prevention of heavy tapeworm infestation.

It is, of course, possible to dust the pits with Rock or Acid Phosphate and to make some progress in keeping down flies in this way, but that entails extra labor which has to be considered when trying to figure any saving in labor due to pits and, furthermore, it is not 100% effective unless a large amount of Phosphate is used. The cost of this Acid Phosphate must be figured, too, unless the poultryman can actually get back his investment in the manure.

Someday perhaps practical and reasonably inexpensive dehydrators and grinders will be available so that such material can be marketed at a considerable profit but as it is now, most poultrymen lose a substantial

amount of money every year because they cannot realize the actual value of the fertilizing ingredients in the poultry manure.

Clean dropping boards have taken their place beside the use of fly spray, electric fly screens, prompt hauling away of manure from the farm, etc., as a means of preventing tapeworm infestation. In our own laboratory we find far less tapeworm infestation in birds sent for examination than was the case ten or twelve years ago and it seems perfectly obvious that improved sanitation on the average poultry farm has given us very satisfactory results in this direction. Can we be sure that the use of dropping pits with their accumulation of manure, attraction of flies, and the breeding of flies, will not reverse this trend and land us right back where we were?

Pits and the Rat Problem

Every poultryman who has used pits for any number of years in houses that were not rat-proof has found that rats soon get to use dropping pits as a home and that is particularly true in the winter. Houses should be rat-proof but genuinely rat-proof houses are in the minority and even in a house that is supposedly rat-proof, rats do frequently get in through a door carelessly left open or in some cases even through openings made for ventilation and have been known to come in on shipments of feed or in egg cases or other supplies.

The longer you let manure accumulate in pits the harder it is to locate rats in them and the more difficult a job it is to get the rats out or kill them. One poultryman told us not long ago that he discovered a number of rats in the dropping pits last winter and found that they had tunnelled through the manure in many places so that is was impossible for him to get at them until the frost had got out of the manure in spring and he could break down the mass. Gas would have done the job, but of course, he didn't want to disturb his birds by taking them out of the house during the winter.

Interfere With Ventilation

Some will argue on either side of this statement but it certainly is true that in the average laying house the pits do obstruct proper ventilation. In the first place the windows at the rear cannot be opened or, if they are opened, serve no really useful purpose and, in hot weather it is highly important to have these windows open. The answer to this might be to place the windows high up in the back wall but there are plenty of disadvantages to that practice, particularly, since it makes it difficult or dangerous to leave the windows open well into the fall when storms might drive in directly on the heads of birds on the roosts, whereas windows underneath the dropping

boards can be left open with little danger.

Furthermore, in systems of ventilation which result in a rotary or rolling motion of the air along the floor and the walls, the pit certainly breaks up any such action and must slow it down if not destroy it entirely. It may be argued that dropping boards also interfere with such air motion, but that is not the case if they are properly built as in most modern poultry houses. There should be a space between the rear of the dropping board and the rear wall and, as a matter of fact, in most modern poultry houses there is a considerable space, often of a foot or more. In many cases the dropping boards are built on tables so that they can be pulled out from the wall several feet in the summertime and pushed back to a foot or less in the winter.

This table arrangement for dropping boards also permits them to be rearranged and poultrymen frequently find that a convenient arrangement is to put them perhaps a third of the way from the back wall toward the front of the house so as to allow space for nests on the back wall. The table-type dropping board is adaptable to any such arrangement but even the fixed type of dropping board can be made to allow ample air space and usually is so made in any truly modern poultry house.

In conclusion, it may seem that we are definitely opposed to pits under all conditions. That is not the case. Pits can be so made and so used as to eliminate many of the objections raised above. Every man has a perfect right to make up his own mind as to whether he prefers pits or dropping boards. All that we hope to do in this discussion is to bring out some points about each system which do not appear to us to have received sufficient consideration by the average poultryman who adopts or is preparing to adopt the pit type of construction on his plant.

If this discussion leads to more careful consideration of all the different aspects of these two systems, it will have served its purpose.

The Farmers Digest Announces A Scholarship Prize Contest

The Farmers Digest is offering a one hundred dollar ($100) scholarship to the winner of the contest.

The rules are as follows:

1. The contest is open only to boys who are members of a 4-H Club, and who will graduate from high school by July 1st, 1942.

2. Each contestant must submit an article of not more than 1500 words on some project undertaken by him in his 4-H Club work at some time during the past three years. The article should contain as many facts and figures as possible.

3. The article must be the original work of the contestant. It must be typed, double spaced on regulation typing paper measuring 8½" by 11". Only one side of the paper is to be used.

4. Each story submitted must be read by the county agent under whom the project was carried out and must be signed by him.

5. The 4-H Club Extension Service in Washington, D. C., will judge all articles, and their decision will be final.

6. The Farmers Digest reserves the right to publish any article submitted in the contest.

7. The Farmers Digest will pay one hundred dollars ($100) towards the further education of the author of the winning article. The money will be paid to the educational institution chosen by the winner and will be applied towards his expenses while there.

8. A one-year subscription to the Farmers Digest will be sent to each of the five boys winning honorable mention in the contest.

9. All articles must be postmarked not later than January 1st, 1942, and mailed to the Farmers Digest, Ambler, Pennsylvania.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.
(See Farmers Digest, November, 1939)

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.
(See Farmers Digest, July, 1940)

Breeding Your Own, or Raising Colts for Pleasure and Profit—By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Conservation in the United States—By Gustafson, Ries, Guise and Hamilton. Comstock Pub. Co. $3.00.
(See Farmers Digest, July, 1940)

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.
(See Farmers Digest, February, 1940)

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.
(See Farmers Digest, October, 1939)

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.
(See Farmers Digest, January, 1940)

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.
(See Farmers Digest, October, 1940)

Fruit Crops—By T. J. Talbert, Prof. of Horticulture, Univ. Mo., and A. E. Murneek, Asst. Prof. Horticulture, Univ. Mo. Lea and Febiger. $3.75.
(See Farmers Digest, June, 1941)

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.
(See Farmers Digest, January, 1941)

Livestock and Poultry Diseases—By W. A. Billings, Asst. Prof. of Vet. Medicine, Univ. of Minnesota. Macmillan Co. $3.50.
(See Farmers Digest, June, 1940)

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, Bu. Animal Industry, 1938, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.
(See Farmers Digest, February, 1941)

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.
(See Farmers Digest, July, 1939)

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.
(See Farmers Digest, September, 1939)

Poisonous Plants of the United States—By Walter Conrad Muenscher, Prof. Botany, Cornell. Macmillan Company. $3.50.
(See Farmers Digest, November, 1940)

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.
(See Farmers Digest, September, 1940)

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.
(See Farmers Digest, December, 1940)

Vegetable Crops—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. Pub. McGraw-Hill Book Co. $5.00.
(See Farmers Digest, May, 1940)

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.
(See Farmers Digest, March, 1941)

Plant Ecology—By W. B. McDougall, Regional Biologist, Santa Fe, New Mexico. Lea and Febiger. $3.00.

For the convenience of our readers, books listed may be purchased through this Department. Address C. Leavitt Dyer, Farmers Digest, Ambler, Pa.

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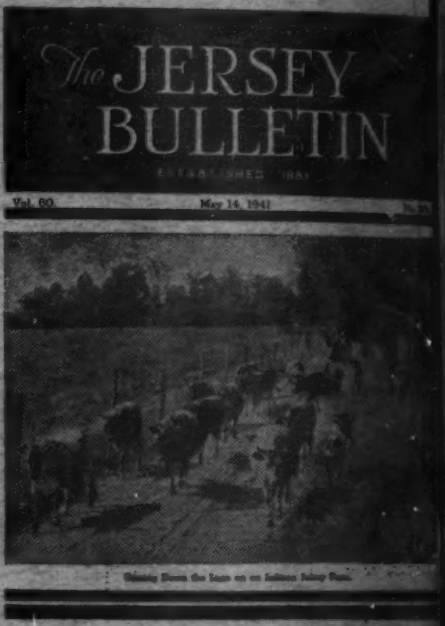

The Jersey Bulletin was established in 1883 and was the first publication to be issued in the interest of a dairy breed. Its circulation is international. The publisher is Royer H. Brown; the editor, C. Earle Smith.

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